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SUMMER SCHOOL COURSES IN GEOGRAPHY 1905

THE JOURNAL OF GEOGRAPHY presents in this number a brief announcement of the courses in geography and geology to be given at colleges and normal schools during the coming summer, so far as the necessary information has been obtainable. For convenience of reference the grouping given is by states.

Intercollegiate Appalachian Course in Geology

A GEOLOGICAL field course of five weeks' duration, for men only, will be given under the direction of several instructors, as follows:

July 3-8—Professor W. B. Clark of the Johns Hopkins University, Baltimore., Md., on the Tertiary and Cretaceous Strata of the Coastal Plain of Maryland.

July 10-15—Professor W. M. Davis of Harvard University, Cambridge, Mass., on the folded Palaeozoic Strata of the Susquehanna-Juniata district of Pennsylvania.

July 17-22—Professor T. C. Hopkins of Syracuse University, Syracuse, N. Y., on the horizontal Palaeozoic Strata and Glacial Features of Central New York.

July 24-29—Professor H. P. Cushing of Western Reserve University, Cleveland, Ohio, on the faulted Crystalline and Palaeozoic Rocks of the Little Falls district, N. Y.

July 31-August 5—Professor J. Barrell of Yale University, New Haven, Conn., on the Metamorphic and Triassic Rocks of Western Connecticut.

This course is intended for men who have already some knowledge of general geology, including field work. The party will meet in Baltimore on Monday, July 3. The fee for the course is $20, payable in advance to Professor W. B. Clark, Johns Hopkins University, Baltimore, Md. The work of each week may be taken separately; the fee in this case will be $5 a week, payable to the instructor of the week. It may be necessary to limit

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the number of students in the first week; preference will be given to those who take the entire course.

CALIFORNIA

Leland Stanford Junior University

Course 3—Topographic Geology: conducted by Professor J. F. Newsom. Field and laboratory work in making topographic and geologic maps and sections. Transits or plane tables are used in doing the topographic work and in locating outcrops and geologic contacts. An area of from one square mile to one and a half square miles must be mapped topographically, and have its areal and structural geology worked out by each student. The time required is from six to seven weeks, the student working from ten to twelve hours per day. The work is done at some point in the Santa Cruz Mountains, not far from Stanford University, beginning July 20. Prerequisites: General Geology (Course 1), Field Geology (Course 4), and Surveying. The fee for students not members of Stanford University is $25, payable in advance. The field expenses will be $40 or $50.

Course 4—Field Geology: conducted by Professors J. C. Branner and J. F. Newsom. This course is designed to teach the student the methods of working out areal, structural, and stratigraphic geology in the field, and of representation of geologic data on maps. The topographic maps furnished by the United States Geological Survey are used as a basis for the work. The students are required to make field notes, to run cross sections, trace out contacts, etc. This course requires forty-two days' work of ten hours per day. For the last four summers the work has been done in the Santa Cruz Mountains, California. In 1905 it will probably be done in the Mount Hamilton Range, in the vicinity of Mount Hamilton, California, beginning May 26. Prerequisites: General Geology (Course 1), and Surveying. All students taking this course are charged a fee of $25, payable in advance. The field expenses will be $40 or $50.

Correspondence relative to these courses should be addressed to Professor J. C. Branner or Professor J. F. Newsom, Stanford University, California.

University of California, Berkeley, June 26-August 5

Ruliff Stephen Holway, A. B., M. S., Assistant Professor of Physical Geography. Frank Forest Bunker, Ph. B., Supervisor of Training, State Normal School, San Francisco.

1—Physiography of the Lands. Assistant Professor Holway. Lectures and discussions on the various forms of relief, their origin and present stage of evolution, including some study of the effect of geographical conditions on

history and the interaction between life and geographical environment. As far as practicable the work will be based on field excursions to be held on Saturdays; special excursions will be arranged for on certain afternoons. Opportunity will be given for laboratory work in the making and interpretation of maps and of models.

2—General Climatology. Assistant Professor Holway. The course will consider Climatology in a broad way, and will include the following factors in their relation to climate: the astronomical relations of the earth and sun, the atmosphere and elementary meteorology, the ocean and ocean currents. The course will be illustrated by experiments in the elementary science involved.

Courses 1 and 2 are designed first to cover the work in Physical Geography in the secondary schools, and secondly, to give some treatment of the lines of more advanced study which may be followed by teachers of this subject. Particular attention will be given to available sources of information concerning physiographic conditions in California.

3—General Geography: Content and Method. Mr. Bunker. The most typical features—historic, economic, artistic, political, or commercial, as the case may be—of each of the natural geographical areas of the world will be chosen; selected references, for the most part to current magazines, will be given on each to be read; and, with this as a basis, through discussions and lectures the attempt will be made to amplify the teacher's general information to such a degree as to make her the master of the text, rather than its slave. Use will be made of the unexcelled informational opportunities which the Bay region affords through Saturday visits to the plants of the various industrial activities thereabouts. Throughout the course much attention will be given to methods of presenting the material of geography to the children of the grades. Particular consideration will be given to the use of the present state-series texts in this connection. Those taking the course will be expected to become familiar through use with the juvenile books which are best adapted to supplementary purposes.

CONNECTICUT

Yale University, New Haven, July 6-August 17

Geology—A course of lectures on the general principles of the science of Geology. Such topics will be discussed as will give an understanding of the structural features of the earth; of the forces by which its present condition has been attained; and of the past history of the earth, including a brief discussion of the evolution of living forms. The lectures will be supplemented by the use of a text-book and illustrated by specimens and lantern

views. Excursions to points of geologic interest will be arranged. This course in Geology is elementary in character and is designed to supply the teacher with the facts and theories necessary for the presentation of similar courses in High Schools, Normal Schools and Colleges; and at the same time to suggest methods of conducting classes and field excursions. For such students as make Geology their chief study and who desire to devote practically all of their time to this course, arrangements will be made for additional work. Such work may consist of study of rock-making minerals, of rocks, of fossils; the detailed mapping of limited areas about New Haven; study of the literature of selected geologic topics, etc. Professor H. E. Gregory.

Physiography—A study of the physical features of the land; ocean; climate; the bearing of these factors on human life. In connection with this course the methods of the United States Weather Bureau will be studied, and frequent field excursions will be conducted. The object of this course is to present the chief topics of physiography in a thorough manner; to furnish the student with subject matter for Physical Geography and a basis for teaching modern Geography, and to suggest methods for conducting similar courses. The field and laboratory work in determination of latitude, preparation of weather maps, study of topographic maps and models, etc., is designed to illustrate methods. For such students as wish a fuller course selected areas of the United States will be studied, both for their value as illustrations of important physiographic features, and as a means of acquaintance with local fields. Such students will be required to do much additional reading. Professor H. E. Gregory and Mr. I. Bowman.

Commercial Geography—This course is a general study of the relation of man to his environment. Climate, soil, topography, and other physiographical factors will be treated as conditioning factors of the production and distribution of goods destined for the satisfaction of human wants. Distribution of the materials of common food (and their physiological values), clothing, building materials, etc. Conditions of transportation: natural water-routes, winds, ocean currents, harbors. Complementary trade-areas, trade-routes and their historical importance. Direct influence on man, as a producer and consumer, of the conditions of natural environment: climate (acclimatization), topography, flora and fauna, etc. Race characters and race distribution; the geography of disease, etc.

The study of Commercial Geography is assuming year by year an increasing importance in secondary education. The text-books on the subject are prevailingly statistical in treatment. In view of these facts, it is designed in this course to furnish the teacher with a knowledge of the

broader physiographical and anthropological principles, whose application is indispensable for the correct interpretation of the statistical and other data of contemporary commerce. It will be seen that this course forms a natural introduction to the study of economics, social science and history.

ILLINOIS

Eastern Illinois State Normal School, Charleston, June 19-July 28

1. Physiography—A study of land forms and the processes of their development. Work with topographic maps and field work. Miss Annie L. Weller.

2. The Geography of the North American Continent—The principles of Physiography and Meteorology are used as a basis of the course. Miss Annie L. Weller.

University of Chicago, Chicago

46. Field Geology (Third Course)—This contemplates thorough and systematic work in close conformity to official standards, and, as nearly as possible, individual and independent. The work of the course may form the basis for a doctor's thesis. Prerequisite: Course 20.

15A. Advanced Physiography; Geographic Geology—The origin, development, and destruction of physiographic features. Especially, the study of the physiographic effects of the atmosphere, rivers, waves, glaciers, vulcanism, and diastrophism. Prerequisite: Elementary Physiography and Elementary Geology. First Term; 10:30. Professor Salisbury.

19. The Teaching of Physiography—A course for teachers of Physiography, especially in secondary schools. An outline of the matter to be presented, and a discussion of the points to be emphasized, and of the methods of presentation. The place of laboratory and field work. Prerequisite: Physiography. First Term; 11:30. Professor Salisbury.

43. Special Geology—Individual work on selected themes for advanced students. First Term. Professor Salisbury.

20. Field Geology (Second Course)—Advanced field work, involving the systematic investigation of a formation or an area. A formal report, as nearly as practicable in conformity with the approved standards of official geological reports, is required. The fields for 1905 will be in the West, and in Wisconsin. The work may be prosecuted during the months of July, August, and September. One party, limited to twelve, under the leadership of Dr. Atwood, will spend the month of August in and about the Black Hills of South Dakota. This party will leave Chicago July 28. Other parties, doing more special work, will study the former glaciation of selected

mountain regions in the West, under the direction of Professor Salisbury, or the drift formations of eastern Wisconsin, under the supervision of Dr. Alden. In the last course the arrangements are individual, and the work may be done at any time during the summer. Each field course of four weeks with a satisfactory report thereon, gives a credit of 3M. Prerequisites: Courses 8 and 16. Second Term. Professor Salisbury, Dr. Atwood and Dr. Alden.

2A. Geologic History of Organisms—An elementary course in Historical Geology. The initiation and evolution of the various organic types; the consideration of the questions involved in geographic distribution and geologic range. Prerequisite: The elements of Physiography and Zoölogy. First Term; 2:30. Assistant Professor Weller.

*20A. Field Geology—In some selected field, not yet determined, the stratigraphic and structural features of sedimentary formations will be studied, with especial reference to the use of fossils in the interpretation of stratigraphy. Four weeks will be spent in the field. The preparation of maps and reports will complete the course. Prerequisites: Same as for Course 20 above. During September. Assistant Professor Weller.

8. Field Geology; First Course (outside of Chicago).—This course is intended to form an introduction to the more specialized professional courses that follow, and to furnish a basis for the teaching of Geography, Physiography, and elementary Geology. It involves training in stratigraphic, glacial, and other field determinations, together with mapping, sketching, and technical description. The field is the vicinity of the Devil's Lake and the Dells of the Wisconsin, in Wisconsin. Four weeks will be spent in the field, commencing June 19. The preparation of a report will complete the course. Prerequisite: First Term. Dr. Atwood.

1A. Physiography—The earth's features, treated with special reference to their origin and significance. Agencies affecting changes in geographic features; physiographic changes in progress; genetic geography. The course will have special reference to North America. Second Term: 2:30. Mr. Barrows.

8. Field Geology (repeated)—The field will be the region about the Dalles of the St. Croix, Wisconsin-Minnesota. The party will start from Chicago July 31. Second Term. Mr. R. T. Chamberlin.

7. Field and Laboratory Course—Study of the geography and geology of Chicago and vicinity, and of relief, topographic, and geologic maps. The course will include two field trips (one on Saturday) and three laboratory exercises (or lectures) weekly. For teachers, and for those who wish to

learn methods of field work. Prerequisite: Physiography. First Term; 1:30-3:30. Mr. Lees.

Students taking this course should take no other afternoon course.

Geography

30. Research Course in Physical Geography—Topics will be arranged with students individually, on conference with the instructor.

11. Economic Geography of North America—A study of the natural resources of the continent, as factors in its economic development. The geologic structure, the physiography, and the climate, treated as factors determining or affecting the location and utilization of mineral resources, arable and grazing lands, forests, etc. The influence of these various resources on the settlement and development of the continent. 8:00.

*1. Elementary Meteorology and Oceanography—An outline course for teachers of Physical Geography and Physiography. Second Term; 1:30. Mr. Barrows.

This course, with Geology 1A = Geology 1.

7. Influence of Geography on American History—A study of the geographic conditions which have influenced the course of American History. Their importance as compared with one another, and their importance as compared with non-geographic factors. Familiarity with the leading events of American History, and with the elements of the Physiography of the United States, is presupposed. Primarily for teachers of Geography and History. Second Term: 9:00. Mr. Barrows.

5. Commercial Geography for Teachers—The scope and method of Commercial Geography, its bibliography, text-books, and original sources. Special topics will be investigated. This course is designed for teachers, and is not an equivalent for the required Junior College course. 1:30. Assistant Professor Goode.

106. Fundamental Considerations in Teaching Geography—Development of the topography of type-forms. Elements of climate. Relation of life to geographic controls. Students are expected to take the special trips given in connection with this course. 11:30. Associate Professor Baber.

37. The History and Geography of the United States—This course will include observation in the University Elementary School. First Term; 8:00-10:00. Associate Professor Baber and Associate Professor Rice.

103. Geography of Eurasia—A study of the physical, climatic, and life conditions of the continent; relation to human occupation and industries. Second Term; 11:30. Associate Professor Baber.

164. Geographic Drawing and Chalk-Modeling--Blackboard sketching

of typical surface features; plains, valleys, mountains, glaciers, cañons, shore features, etc.; cross-sections and pictorial representations of large sections of continents, as plateaus, river basins, and mountain systems; chalk-modeled relief maps. The work will be done on paper as well as on the blackboard. First Term; 2:30. Repeated, 3:30. Mr. Thorne-Thomsen.

Anthropology

1. General Anthropology—Outlines of the science. Tylor, Anthropology. The class work will be based on the text-book named. 11:30. Associate Professor Starr.

15. The Pueblo Indians of New Mexico—The series of class lectures are directive to the literature. Students will investigate and report on special topics. 10:30. Assistant Professor Starr.

University of Illinois, Urbana, June 12-August 11

Physiography

S 1. Elements of Physical Geography—A laboratory course in physical geography. Gilbert and Brigham's Introduction will be used as a text, and selected topics taken from it will be made the basis of the term's work. The exercises will be mostly in the field. When conditions do not favor work in the field the time will be spent on problems in meteorology, climatology, weather prediction, and land sculpture, as illustrated by contour maps and lantern slides. Daily: (2½.) Mr. Fox.

S 2. Teacher's Course in Physical Geography—This course is designed primarily for those who expect to teach. The work includes discussions of the most approved methods of presenting each topic in class room, field, and laboratory, and the use which can be made of local geography, topography, and geology together with the fauna and flora as illustrative material. It also includes the selection of topographic sheets issued by the United States Geological Survey which show well developed topographic types, and their proper use in the class room; the manufacture and use of models and all other means by which the principles of the science may be experimentally studied. It further includes observations on character of clouds, direction and velocity of wind, temperature and humidity of the air, and their relation to weather changes; the study of weather maps, and the construction and use of simple apparatus for meteorological observations. A study is made of the geographic elements which have combined to produce the peculiarities of surface and climate of selected regions and the effect which these combinations have had on the historical, commercial and industrial progress of their inhabitants. Daily; (2½). Mr. Fox.

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Required: An approved course in elementary physical geography, or Geology 8, as described in the catalog of the University.

INDIANA

Indiana State Normal School, Terre Haute, June 26-August 26

Geography

Charles R. Dryer, Head of Department. William A. McBeth, Assistant Professor.

Three courses in Geography will be given:

1. Physiography—The description and explanation of land forms. Examination of type forms in the field. Study of common minerals, rocks and soil, and interpretation of maps in the laboratory.

2. Meteorology—A study of the atmosphere, weather and climate. Principles of weather forecasting and construction and use of weather maps. Laboratory work and instrumental observation.

3. Physical and Political Geography of the United States—A study of the Physiographic regions of the United States in relation to the distribution of mineral, plant and animal products. Source, movement and growth of population. Manufactures, transportation and commerce. Location and development of cities. Map drawing on mathematical projections. A well equipped laboratory and an ample and carefully selected list of reference books facilitate the work in this department.

IOWA

Drake University, Des Moines, Iowa

Course 1. General Geography—The principal points of the field of Geography will be reviewed and current geographical questions will be discussed. In connection with this course will be a study of Physical Geography by excursions to neighboring regions. River valleys, flood plains, glacial deposits, rock stratification, etc., will be studied along the Des Moines and Raccoon river valleys. Visits to the coal mines, and the various industrial plants of Des Moines will be made under the direction of the professor in charge. Professor Nichle.

Course 2. Methods—This course will outline the work of the various grades showing the subject matter adapted to the work in each grade and the best manner of presenting it. The various text-books will be examined and everything that will contribute to the interest and value of work in Geography will be discussed. Professor Nichle.

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KANSAS

University of Kansas, Lawrence

Course 9. Summer Field Work in Geology: conducted by Professor Erasmus Haworth. A course in field geology for the study of stratigraphy, geology, and economic products of the Carbonic formations of eastern Kansas, southwestern Missouri, and northern Indian Territory. Probably no other part of America affords a better or more complete section of the entire Carbonic than does Kansas and the Indian Territory, and certainly few equal this area for the production of lead and zinc ores, coal, oil and gas, clays, and suitable materials for the manufacture of Portland cement, all conveniently close together. Opportunity will be given for specialization in stratigraphic geology or in the economic geology of the area. As far as possible individual work will be encouraged. The party will form at Lawrence, June 8. Length of course, six weeks. Cost: Tuition for residents, $10; for non-residents, $20. Field expenses moderate, probably not exceeding $50. Apply to Professor Erasmus Haworth, Lawrence, Kansas.

MASSACHUSETTS

Harvard University, Cambridge

Course S 2. General Field Geology: conducted by Assistant Professor J. B. Woodworth. This course will devote five weeks to field work at selected localities in southwestern Montana. The region to be visited affords numerous extended sections of the geological column, with a great variety of mountain structures and of topographical forms. Practical instruction will be given in the identification of formations by means of fossils, and in the preparation of maps, sections, and reports. The party will leave Bozeman, Montana, on July 10, and camp at various points in the region studied. Members of this course should have already gained an elementary knowledge of geology. Decision to join the excursion should reach the instructor not later than June 20. The fee for the course is $20, payable in advance to Mr. Charles F. Mason, Bursar, Cambridge, Mass.

The income of the Josiah Dwight Whitney Scholarship fund, yielding two scholarships of $100 each, is available for members of this course, whether they are regularly enrolled as students of Harvard University or not. Applications with testimonials should be received not later than May 25, by Professor W. M. Davis, Cambridge, Mass., from whom a circular giving fuller information may be obtained.

Course S 3. Advanced Field Work—Training in field research, and in the methods of professional geological field work. Professor Shaler and

Assistant Professor Woodworth. Advanced students may be furnished opportunity for independent work, with a view to the publication of their results. Students who complete S 2, and manifest an ability for independent field work, may continue work in the Rocky Mountains under the direction of Professor Shaler and Assistant Professor Woodworth. This course may be counted as a whole course for the bachelor's degree by those students who fulfil the conditions set forth on page 8 of the Harvard Summer School Announcement, and devote not less than ten weeks to the course.

Course S 3*a*. Geological and Geographical Exploration in Iceland: conducted by Assistant Professor T. A. Jaggar, Jr. This excursion will start about June 15, and proceed via Edinburgh, Scotland, to Reykjavik, Iceland, arriving there about July 1. Four weeks will be spent in the study of volcanoes, glaciers, and geysers, and a tour around the island will be made by steamer. A limited number of students (men only) may join the party. Advanced students may undertake the study of special problems. Further information may be obtained by addressing Professor T. A. Jaggar, Jr., Cambridge, Mass.

MICHIGAN

Michigan State Normal College, Ypsilanti, June 26-August 4

General Geography of the Continents—Four hours weekly. A course of lectures will take up the physical features that seem to exercise most evident control on the distribution of man, and the social and political reactions of men to the control. An examination will be offered to those who wish credit in this course. 11 a. m. Professor Jefferson.

Field Geography—Teachers' half-course, four times weekly. Saturdays a half day and three other days from 2 to 4 p. m. There are two aims in this work: 1, to help teachers to recognize the geographic features of the landscape, and 2, to plan the use of these out-door forms in teaching with a text-book. Professor Jefferson.

Advanced Geography—Teachers' half-course, four hours a week. Preparation by students under the direction of material and plans for intensive lessons on the geography of Russia, Germany, France, Great Britain and some other countries with constant comparison and reference to the United States. Room 18, 10 to 11 a. m. Applicants for this course should have some previous training in geography. Professor Jefferson and Miss Lockwood.

Geographic Excursions—On Wednesdays, 7-9, Miss Lockwood will conduct walks about Ypsilanti, visiting picturesque spots about the city, and pointing out especially the history of the landscape and those geographical

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processes that commonly pass unnoticed, with the object of illustrating the possibilities of out-of-door work with public school classes. On Saturdays longer excursions will be made, some of them on the Detroit river to the Lakes. These will offer the best of opportunities for geographic study at very moderate cost, and under agreeable conditions. These excursions will be open to all students of the Summer School, whether enrolled in a class in geography or not. They will be planned consecutively, each in a measure preparing for the next, and will illustrate the work in geographic courses, but students who wish to accompany single excursions may do so.

MINNESOTA

University of Minnesota

Two courses in geology will be offered at the Minnesota Seaside Station on the Pacific coast near Port Renfrew, Vancouver Island, during the six weeks from July 8 to August 18, 1905, Professor C. W. Hall in charge.

Course 1. District Geology—For teachers and students. This course will comprise a study of the influence of the atmosphere; water dynamics—streams, waves, tides, and currents in their destructive and reconstructive effects; sedimentation and the structural and textural features of stratified rocks; volcanic activities and rock alteration. The special work from day to day will be determined by local conditions and individual needs. Excursions are to form a prominent feature of this course.

Course 2. Problems in Geology—For advanced students. Problems will be selected by the advanced students and prosecuted under such supervision as is necessary. This will be a course in field and research work. Exceptional opportunities are offered for field work connected with the collection of petrographic material and for physiographic geology. Daily programme: The Station day extends from 8 to 12 a. m. and from 2 to 6 p. m. The programme for field work will meet the wants of the students. Lecture rooms are available and the material is immediately at hand. On the return trip it is expected that a week will be spent among the glaciers of the Canadian Rockies. A day's excursion will be made to the trilobite beds of Mount Stephen. The entire expense from Minneapolis, including tuition, station privileges and travel, covering almost eight weeks, can be kept within $166; if only four weeks be spent at the station, $25 less than that figure.

MISSOURI

University of Missouri, Columbia

2a. Physiography—A course of study in the principles of physiography as illustrated in the physical features of North America. The subject will

be taken up from the point of view of the needs of the high school teacher of Physiography, and will include the subject-matter as well as the equipment necessary for presenting it. The work will consist of laboratory and field work with occasional lectures and conferences. Six times a week; (3).

6a. Physical Geography—This is a course of study in general physical geography, covering the ground of the average high grade text-book. It will be presented as a lecture, library, and laboratory course and may be taken as a preparation for more advanced geographic work or for teaching the subject in high schools. Six times a week; (3).

NEW YORK

Columbia University, New York City

Geography

s3a. Geography of North America—Lectures and collateral reading. Miss Kirchwey. 9:30, A topical outline, illustrated by maps, models, and photographs, of the geography of North America, indicating the causal relation between the physical and life conditions. Designed for teachers in the intermediate and upper grammar grades; planned to show, through the study of North America, how each of the continents may be treated. Training in the use of reference books, and organization of subject-matter, by special papers. Topics: the position of the continent in latitude and longitude, in the wind systems, in reference to the oceans, and the effects of each; distribution of the surface features; the coast line; relation to other continents and the historic importance thereof; the position of the United States. Each physical division of the United States will then be considered as to political extent, surface, climate, soils, water supply, economic resources, and life conditions. The relation between geography and history will be emphasized whenever possible. Herbertson *Man and His Work,* Dodge, *Advanced Geography,* and Brigham, *Geographic Influences in American History,* will be the leading texts, though reference will be made constantly to Semple, *American History and its Geographic Conditions,* and Trotter, *Geography of Commerce.*

s32a. The Teaching of Geography—Lectures, conferences, and library work. Miss Kirchwey. 10:30. A consideration of the course of study in geography for elementary schools and of the general principles underlying good geography teaching. Work will be made as practical as possible with much discussion of the best method of presenting to the children the difficult problems met in the various grades. Each student will outline some special topics, adapted to the grade or grades of interest to him. Class criticism and discussion of these topics, outlined as lesson plans suited

to certain grades. Especial attention to ways of teaching the present course of study in the New York City schools. Redway, *New Basis of Geography*, McMurry, *Special Method in Geography, The Course of Study in Geography in the Horace Mann Schools*, and Dodge, *Elementary and Advanced Geographies* will be the leading texts.

Geology

s1a. General Geology—Dynamic, structural, and physiographic. 1½ points. Dr. Berkey and Mr. Gordon. 11:30. Lectures will be given on the principles of physical geology, including the constituents of the earth; the work of the atmosphere, water and ice; the development of erosional topography; igneous agencies and their effect; and orogenic and epeirogenic disturbances. Special instruction will be given in methods employed in field work, the making of geologic maps, and interpretation of structural relations, with practice and applications in the field about New York. The course will be illustrated by a collection of typical rocks, topographic and geologic maps, and structural models. Short field excursions will be a regular feature. Text-books and references: Dana, *Manual of Geology;* Geikie, *Text-Book of Geology;* Scott, *Introduction to Geology;* Kemp, *Handbook of Rocks;* Chamberlin and Salisbury, *Geology I.* At the close of the session a three-day excursion (optional) to Kingston, N. Y., may be made if a sufficient number desire to go. The structure is complicated and extremely instructive, illustrating many of the principles discussed in the course. Fossils are numerous and practice in discriminating horizons will be given. Total expense not over $12. Open to all students in any of the courses in Geology.

s4. Petrography—Dr. Berkey and Mr. Gordon. 9:30-11:20. This course includes lectures on the principles and methods of rock study by means of the petrographic microscope; a discussion of rock classification; description of the chief groups; and instruction as to interpretation of the structures and textures seen in them. There will be systematic laboratory study of the chief types of rocks, both in hand specimen and thin section, and practice in identification and formal description. The facilities for laboratory work are very complete and if desired arrangements can be made for extra time. A knowledge of the elements of mineralogy is assumed. Text-books: Harker, *Petrology;* Reinisch, *Petrographisches Praktikum, I and II;* Kemp, *Handbook of Rocks.* Equivalent to Geology 4, Columbia University.

s3a. Economic Geology—Dr. Berkey and Mr. Gordon. 1:30. Lectures will be given on the occurrence and origin of the ores of the metals,

the characteristics of ore bodies, and relationship to geologic structure. The leading districts and chief types of deposits will be described and their ores exhibited. The facilities for examination of representative material and for systematic reference reading are very complete so that extra time may be devoted by the student as desired. Reference books: Tarr, *Economic Geology of the United States;* Kemp, *Ore Deposits of the United States;* and economic papers of the Geological Surveys. It is planned to continue this subject in a more advanced course (s1*b*), next year, the two courses being counted equivalent to Geology 3, Columbia University.

Palaeozoic Stratigraphy of New York State—Conducted by Professor A. W. Grabau. Three weeks of field work at important localities in New York (and possibly in neighboring points of Pennsylvania and Ohio), covering the formations from the Potsdam Sandstone to the Coal Measures. This course is open only to those who have already studied stratigraphy to some extent. It may be taken by graduate women students. The party will leave New York City about May 25. The field expenses will be about $75. The fee for students not already registered in Columbia University will be $20, $5 of which covers the registration fee. For further information, address Professor A. W. Grabau, Columbia University, New York, N. Y.

Cornell University, Ithaca, July 5-August 16

Geography

A. Home Geography—A systematic statement of the chief phases of Home Geography with numerous illustrations. Excursions to fields, shops, factories and local industries will be treated at length. The mode of handling such excursions with classes of children is discussed. The relation of this excursion work in Home Geography to later studies is traced out. It is expected that a number of these local excursions can be taken to suitable places in and about Ithaca. Geologic Lecture Room. T., Th., 10. Professor McMurry.

B. Type Studies of North America—The course of study on North America is worked out in a series of important types suitable for the instruction of children in the grades. Around these types as centers the important facts are organized. A number of these type studies are given a full treatment so as to illustrate the value of types and the principles of method in class instruction. The general movement through the grades is planned and the relation of these topics to earlier and later studies illustrated. Geologic Lecture Room. M., W., F., 9. Professor McMurry.

C. Type Studies of Europe—Europe as the second chief center of

geographic study is treated in a series of chief topics or types, with incidental review of previous studies on North America. The movement from Europe to the other continents is discussed at length. In combination with the previous course this will give a full survey of the whole elementary course in geography. Geologic Lecture Room. T., Th., 9. Professor McMurry.

D. Aims and Problems in Geography—Designed more particularly for Grammar School teachers. The course consists of lectures, discussions, and exercises dealing with the actual problems of the class room. Some of the topics treated are: the chief aims in teaching geography; the relative value of different kinds of geographical knowledge; methods of conducting the recitation; the proper use of the text book; the use and misuse of supplementary books; map modeling, map drawing, and the use of outline maps; use of pictures; field and factory trips; simple laboratory exercises; simple methods of teaching the earth's movements, the tides, etc. Course J is recommended, though not necessary, to accompany this course. Geologic Lecture Room. T., Th., 11. Supervisor Whitbeck.

E. Geographic Influences and Relations—Lectures and studies designed to show the influence of physiographic and climatic conditions upon human activities: the influence of soil, coast line, mountains and valleys, plains and plateaus, gaps and passes, winds, rainfall, ocean currents, altitude and latitude, navigable inland waters; geographical causes leading to the location and growth of cities, the location and migration of industries; man's reaction upon his environment and his conquest of natural obstacles. Geologic Lecture Room. M., W., F., 11. Supervisor Whitbeck.

F. Physical Geography—A lecture course upon modern physical geography, including the lands, the seas, and the atmosphere. The development and systematic classification of the leading physiographic features will form the basis of the course. Some of the topics discussed are: rivers, plains and plateaus, shore-lines, mountains, volcanoes, glaciers and the glacial period; the ocean, its composition, movements and work; the atmosphere, general circulation, cyclones and special storms. The lectures will be fully illustrated by lantern slides. Students electing this course are advised to take also the two related courses, G and H. Geologic Lecture Room. M., T., W., Th., 8. Mr. Hubbard.

G. Laboratory Course in Physical Geography—This course includes both subject matter and methods. Although the course is arranged primarily for teachers in high schools, yet it is so planned as to be of advantage to grade teachers who anticipate teaching geography in the high school. The laboratory equipment used in the course consists of numerous models,

XUM

charts and maps; much attention, however, is given to the possibilities open to teachers in schools having limited laboratory equipment. So far as possible the work offered will be arranged to meet the individual needs of teachers; where desired by a teacher, personal suggestions will be made regarding the local field work he may carry on with his classes. Among the specific topics treated are the following: the interpretation and use of topographic maps; study of topographic maps and models illustrating type land forms; the assembling and mounting of topographic sheets into useful type maps; physiographic influences; the use of photographs; common rocks; weather maps. Physical Geography Laboratory. T., Th., 2-4. Mr. Hubbard.

H. Field Course in Physical Geography—One afternoon each week and two Saturday all-day excursions are devoted to the study of physiographic phenomena in the field. In this field work a study is made of river valley forms, both young and mature; waterfalls; lakes; and typical glacial deposits, including moraines, drumlins, kames, eskers, and overwash plains. Monday afternoon. Mr. Hubbard and Supervisor Whitbeck.

I. Round Table Conference in Geography—There will be several evening conferences for instructors and students in geography, at which discussions of important general topics in connection with geography will take place. Some topics discussed in previous years were Nature and Scope of Geography, Principles Determining the Course of Study in Geography, Excursions and Laboratory Work in Geography, Sources of Geographic Knowledge. Attendance on this course is purely voluntary and cannot be counted for University credit; but such free interchange of views among teachers and students is expected to throw much light on problems of teaching and on working methods.

J. Elementary Earth Science—Six field trips; matter and method will both receive consideration; suitable for grammar and high school teachers. (See also Nature Study, p. 28.) (1) How the soil is made; its differences and qualities. (2) The work of the smaller streams. (3) The work of the larger streams. (4) The story of the rocks; collection of specimens. (5) The stories the pebbles tell; collection of types. (6) Some changes wrought by the great glaciers. Friday afternoon, 2-4:30. Supervisor Whitbeck.

New York University, New York City, July 6-August 16

S23. Methods in Geography—The first step in this course will be the consideration of the three fundamental propositions involved in method in geography: (a) The nature of the mind so far as it has a direct bearing

upon the organization of the subject-matter and the method of teaching geography. (b) The nature of geography. (c) The purpose of education. The second step will be the organization of a course of study in geography for the grades that will harmonize with the nature of the growing mind and the nature of geography, and that will serve as one of the instruments by which the purpose of education is to be realized. The course of reading connected with this work is intended to acquaint the student with the literature of the subject, and to make him familiar with the sources of geographical information. Professor Mitchell.

S1. Physiography—The purpose of this course is to give as comprehensive a view of the science of Physical Geography as the limited time will permit. The scope of the work will include such topics as: The earth sphere—its significance and what it means to teach it; the hemispheres—how determined and their geographical significance; the atmosphere, including its general circulation and weather forecasting; the effect of atmospheric movements upon the distribution of plant, animal, and human life; the gross structure of the continental masses, and the geographical significance of such structure, etc. The work will consist of lectures and informal conferences on the various phases of this branch of study. This course will be especially helpful to teachers of geography, and especially so to those that are teaching the subject of physical geography in the High School. Students intending to take this course should bring with them such text-books on Geology, Physiography, Meteorology, Physics and Physical Geography as they may happen to have. Professor Mitchell.

NORTH CAROLINA

University of North Carolina, Chapel Hill

Course 13. Advanced Course in Field Geology—Professor Collier Cobb in charge. An advanced course in field geology for students who have already completed an elementary course will begin at Chapel Hill, on July 3, and last five weeks. The class will study the Triassic beds and their lavas in a series of excursions from Chapel Hill. Short excursions from Cumnock and Sanford will be made to deposits of the Lafayette and Columbia formations. The party will return by the eastern border of the Triassic area, seeing the crystalline schists near Raleigh and the older volcanic rocks near Cary. The work will include geological mapping and the preparation of a detailed report. The field expenses will not exceed $50. The tuition fee will be $20, payable in advance to W. T. Patterson, Bursar, Chapel Hill, N. C. For further information, address Professor Collier Cobb, Chapel Hill, N. C.

WISCONSIN

9. Field Petrology—The aim of this course is to afford the student so much of a knowledge of rocks as is essential to their study in the field in connection with the preparation of geological maps. No previous knowledge of mineralogy is required, though such knowledge confers special advantages. The large rock collection stored in the department (see Geological and Mineralogical Museums) are drawn upon for illustrative material. Several short and one or more longer excursions will be included in the course. M., Tu., W., Th., F. Two-fifths credit.

3. Field Geology—This course is identical with course 3, as given in the regular University year. It is open to students who have had general and historical geology equivalent to courses 1 and 2, described in the annual catalogue. Students work in parties of two. An area near Madison is assigned to each party. The students make their own topographic maps by the use of plane table, alidade and barometer. With this topographic map as a base, each student prepares a geological map and a written report on his area. A brief introductory explanation of methods is given, after which the instructor divides his time among the parties in the field. The work of the course occupies about one-half of each day, for five days in the week, thus leaving Saturdays open for the longer class excursions, accompanied by the instructor. The area covered by the detailed studies is within the glaciated region, but near its margin, and contains good types of the styles of topography of glacial origin. The scenery and geological processes of lakes are especially well shown. Rocks of the older Paleozoic are exposed in cliffs, ravines, railroad cuts, quarries, etc. An all-day trip by wagon is made to the driftless area, others by rail to Blue Mounds, Devil's Lake, the Baraboo Ranges, the Dells of the Wisconsin River and probably to other points of combined geologic and scenic interest. Those contemplating taking this course should correspond with the instructor, stating what previous work they have had in Geology. Two-fifths or three-fifths credit according to work done.

Class Excursions—It is understood that Saturdays will be held open for longer excursions by students in courses 3 and 9. Most of the trips are made in the vicinity of Madison, which affords excellent illustrations of physiographic development and the operation of geological equats. Students in course 7 will be welcomed in these excursions.

XUM

A CLASSIFICATION OF RIVERS BASED ON WATER SUPPLY[1]

BY ISAIAH BOWMAN

Cambridge, Mass.

IN the present-day teaching of geography great emphasis is placed on the close relation between the physical controls of the Nile River in Egypt, and the responses in the life of the Nile valley which those controls evoke. This vital relation between the river and the life along its banks has for centuries been an absorbing theme in geography. The contrast between the sterile desert, with its sand dunes and rocky ledges, and the river flanked by strips of garden-farms with patient tenants, appeals to that universal interest in a unique human struggle.

But the great human interest which many geographic problems arouse often results in the failure to recognize, at least in practice, those principles, in the light of which all the facts of our subject should be viewed. Geography as a science eagerly includes the Nile with all its attractive features, but it goes farther and recognizes it as one of many rivers which exhibit similar characteristics, and contrasts it with still other rivers which exhibit different characteristics: it regards the Nile as a striking illustration of a type of stream of which there are numerous other examples scarcely less interesting. The systematic treatment of geographic details does not destroy, it sustains and broadens the interest, insures a more thorough understanding of the individual thing, because it appears in relation to its fellows, and makes geography a unit and a science, not a collection of interesting facts.

It is because of this systematic treatment of data relative to the periodic rise and fall of streams, as given in a chapter of Woeikof's "Die Klimate der Erde," that the following translation of the most useful and interesting part of the chapter is presented. Woeikof's is apparently the only attempt which has been made to present the data in this manner. Both Reclus and Günther treat the rise and fall of a few streams besides and including the Nile, but neither emphasizes the generality of the process. Additional interest attaches to the classification, in that it was first printed in Russian in 1884, in the first edition of Woeikof's work.

It is hoped later to present the above and other similar data in closer

[1] The writer's attention was first called to Woeikof's thesis by Professor R. DeC. Ward in the course in General Climatology, Harvard University, to whom thanks are due for generous assistance in the revision of the translation.

conformity to the genetic as well as the evolutionary idea, but for the present the mere translation is given.

"Springs, brooks and rivers are a consequence of atmospheric precipitation; they carry to the oceans and to those lakes without outlet the water which remains after evaporation from the surface and absorption by the ground and by vegetation have played their part; and from these great basins evaporation is again effective before the waters begin their circulation anew. Being the result of precipitation, streams must reflect the periodicity characteristic of precipitation, and it is possible to establish types of streams expressing the quantity, character and periodicity of the precipitation. A few cautions which will prevent error should be observed, especially in those continents in which the run-off has not been measured very accurately.

(1) In considering the amount of water in rivers, it is easy to consider lowlands, especially near the mouths of streams, as moister than they really are, since with a gentle slope there is more water in evidence than in the case of a steeper slope. At times of high water rivers inundate such areas, often miles in width. On the other hand, where streams run through a rocky country each increase of water-supply is manifested by a marked rise of water. It is easily possible, therefore, that we should come to a false idea of the importance of the cause from the examination of tables showing the height of water in streams within narrow confines.

(2) A large stream expresses in its run-off an average of the climatological influences which operate over its entire basin, and, as is the case with every average, it is interesting to resolve it into its component parts. Small streams give a truer idea of climatological influences, since in small regions the climate has less opportunity to vary.

(3) The distance of a given point from the upper part of a river basin and the velocity of the current must be kept in view if any conclusion regarding precipitation is to be drawn from the flow or rise of streams. In large streams the delay is very noticeable. For example, at Astrakan the Volga attains its highest stage in June, about two months after the snow has melted in the upper basin of the Volga and Kama. High water in the Nile, the result of the Monsoon rains in 5°-15° N. latitude approximately, reaches Egypt in September, two months after the greatest rainfall.

(4) The penetrability of the soil and of rocks must be taken into careful consideration. The more penetrable the earth the longer time will elapse before rivers are filled after a given storm. In this manner Belgrand, *e. g.*, through his striking investigations in the Seine valley, predicted the time of high water and of maximum rise in Paris with complete accuracy. When the winter temperature is significantly below 32° F., the ground is still

frozen at the time the snow is melting in the spring; and even though the surface is ever so porous, it becomes impermeable because of this condition. Water resulting from the melting of snow runs off more quickly therefore than rain water.

(5) Care must be exercised in the consideration of evaporation which becomes more rapid as the air becomes dryer and warmer. For this reason the rains of summer have less influence on the rise of streams than those of colder seasons, and more especially at the time when snow is melting. Hence the rivers of Europe have high water so seldom in summer, even in regions where summer rains prevail. (Mountain are the only exception in this case.) Belgrand was even of the opinion that summer rains could not produce high water. This is quite right for the Seine basin, but the statement is not borne out in some other localities. In warm regions, where from twenty to forty centimeters of rain falls in a single month, as in the case in many regions where tropical or monsoon rains occur, the streams rise very rapidly, no matter how much water evaporates from the ground or from vegetation.

(6) Lakes have a great influence on the height of water in their outlets. They serve as regulators of the height of water and, when of sufficient size, they may even conceal the yearly periodicity of the rise of water. I shall name such streams: lake streams. In the largest of European lake streams, the Neva, there is really no change in the water level observable as depending upon the inflow of rain and snow water. Highest water comes in December, the least in May and depends on the winds. Inundations do not occur in St. Petersburg soon after the melting of snow, while they are common in the rest of Russia and commonly attain a maximum in the autumn, when the strong and persistent west winds dam up the water. The farther from a lake a stream is, the greater the number of tributaries it receives, the more its régime changes, and the nearer it approaches that of other streams of the same region. In this manner, the Rhone, which is a true lake river, from Lake Geneva to Lyons, has but slow and insignificant changes of level. The Saone influences the Rhone significantly, and the farther towards the mouth, the more rapid and great become the changes in levels, at least as far as the delta, since the Rhone is joined here by mountain streams which are controlled by extremely high water.

The following types of streams may be recognized:

(A) Streams which receive their supply of water from melting snows in flat regions, or in moderate elevations up to about three thousand feet in height.

This type is nowhere ideally represented but in a few regions the streams

receive the greater part of their water from the melting of snow. Examples are the streams of Siberia and of northern North America, and of the North American archipelago, where the snow lies on the ground from eight to ten months of the year.

(B) Streams which derive their water from melting snows in mountains.

This, like the former, occurs nowhere as a pure type, but there are regions in which the streams receive all but an insignificant share of their water from this source. Such are the streams which encircle the western part of the massif of central Asia. The Amu- and Syr-daria, the Tarim and the upper Indus belong to this type. In their lower reaches they flow through regions in which but little rain falls, and if in their middle courses some rain falls, it occurs almost exclusively in winter. In such cases high water is the result of the melting of the snow on the mountains, and as the temperature changes are pretty regular, the occurrence of high water is also regular, while the maximum height is dependent upon the amount of snow that has fallen during the winter. The water in such rivers becomes of great value for irrigation, without which the middle and lower portions of their courses, which run through dry areas, would be quite uncultivable. Streams which derive their water from melting snows in mountains are particularly valuable, inasmuch as the rise of water is regular and occurs when vegetation is most in need of irrigation.

(C) The streams which derive their water from rainfall and have highest water in the warm season of the year.

This type depends on tropical and monsoon rains. It is most clearly typified in some large river systems—for example, in the Orinoco and Congo, over which no snow ever falls. In winter, which is usually the dryest season of the year, the streams are low and are fed principally through the supply of springs; while in summer the supply of rain is so copious that, in spite of great evaporation and in spite of the great amount of water which is held back in the great forests and swamps, enough remains to cause a regular yearly rise of water in the streams.

Some tropical streams, such as the Amazon, also receive some water from melting snow in the mountains; but this is inconsiderable, for the snow covered areas are very small because they do not occur except at an elevation of more than twelve thousand feet. Extensive areas of such heights are rare in the tropics. (Southern Peru and Bolivia are approximately this height, but they are dry.) The result is, since the temperature changes are not great throughout the year, that there is no season of the year in which large areas of snow melt at the same time; besides, most of the snow falls at the

time that the rains fall. As the addition of snow water is neither large nor limited to a certain time of the year, there can be no high water in the streams as a result of this cause.

The Nile belongs to this type. It receives its high water from the monsoon rains which fall in summer, and between latitude 5°-15° N. The Ganges and the Brahmapootra are also of this type principally, but they receive part of their water from the melting snows in the Himalayas and in the mountains and plateaus of Thibet. The large streams of China belong also to this class; that is, they have low water in winter, and high water, which is derived from the monsoon rains, in summer and in the beginning of autumn. In Hanchou, in the middle course of the Yang tse Kiang the water rises regularly in summer, sometimes rising nearly 50 feet above its winter level, and the whole surrounding plain is inundated. This cannot be derived from melting snows in the mountains, for in the highest parts of the mountains to the west but little snow ever falls. (Prschewalski found no continuous snow cover in the plateau of Thibet at an altitude of over 15,000 feet in winter with temperatures extremely low.)

It is noteworthy that the Amu- and Syr-daria, which head in the western part of the central massif of Asia, and the Chinese streams which rise from the east of the same massif have their high water at the same time, namely, in summer, notwithstanding the periods of precipitation occur in exactly opposite seasons of the year—in the former, in winter; in the latter, in summer. In the former the precipitation is in the form of snow in the mountains; in the latter, as monsoon rains in the flat regions. For this reason the rise of water occurs in both of them at the same time of the year. The Amur, and also its tributaries, have no regular time of high water in spring, though one might reasonably expect a rise after the severe winter. This is explained by the light snow-fall of winter, except near the mouth of the stream. As summer advances however the Amur and its tributaries often experience a significant rise, and devastating floods have occurred here. The first Russian settlers suffered greatly from these floods before they became adjusted to the climate; for example, they had previously left their hay out in the meadows, as is the custom in Russia, but here, in the high water of summer, it floated away. As the mountains are not sufficiently high to retain snow until August, the high water is naturally a product of rainfall. High water which occurs because of the melting of snow, is apt to be more regular than otherwise. A similar régime obtains in the Baikal region: The Selenga has no high water in spring, but often rises in the summer because of rain. In central and southern Trans-Baikal, sleighing

is seldom possible, although the average temperature of the three winter months is about five degrees below zero F.

Even the infrequent overflows of Lake Baikal come in years of particularly heavy rainfall, for example, on the occasion of the one in the year 1869, as Orlow has clearly shown.

The régime of the Chinese rivers, as well as those of Manchuria and the lands near the Amur, demonstrates the extension of the monsoon climate much farther north and west than was formerly supposed, a fact first asserted by me (Zeitschr. f. Met. Bd. V. S. 39). When the rivers are at the high water stage following the summer rains and are low in spring and winter, the meteorology must be of a very distinct monsoon type, for, with an insignificant excess of summer rainfall, the rivers would still be low on account of the rapidly increasing evaporation in the warm season.

West of Lake Baikal there occurs the following type:

(D) The rivers which get a large part of their supply from rains, but where high water is the result of snow-melting.

Although in the greater part of the region in which this type belongs, summer precipitation predominates, the rainfall is usually much lighter than in the tropics or in the region of monsoon rains, and, on account of great evaporation, these rains are not generally followed by high water in the streams. The melting of the snow, on the other hand, furnishes a great deal of water at once, and since the ground is then frozen, the water reaches the streams very quickly, frozen ground being impenetrable to water. Moreover, evaporation is not as great during and after the time of the melting of snow, as in summer. The foregoing makes it clear why high water should systematically follow the melting of the snow and why the water should be higher than at any other time of the year, even though but a fifth or a sixth of the precipitation is in the form of snow. High water following the melting of snow over lowlands and hilly countries is an impressive sight on account of its great geographical extent, and also because of the regularity in the time and maximum height of the rise. There is great contrast between the rivers on the plains of eastern Europe, with their regular spring rise, and those of western Europe, where the periodicity almost disappears, although this certainly does not exclude occasional overflows. To this type belong most of the rivers of northern and western Siberia, although the farther north one goes, the nearer the streams approach type (A). To this type also belong most of the rivers of European Russia, those of Scandinavia, eastern Germany, northeastern United States, and some of the streams of the northern part of North America, where, as in Siberia, the farther north one goes the nearer they approach type (A). Over the

greater part of European Russia precipitation in the form of snow, measured as water, amounts to from four-tenths to eight-tenths of an inch per annum, or about from one-third to one-sixth of the annual precipitation; in the southern part the snowfall is, of course, much less. In the European-Asiatic part of the region under discussion, the average rainfall of each of the summer months is not over four-tenths of an inch, in the rainiest months about one inch. (Such an abundance of rain as the latter number indicates is largely local.) For this reason the influence upon the streams is insignificant. Only the mountain streams rise oftener in summer on account of the greater precipitation and their steeper descent. In the southern hemisphere, Type D is missing, since in the only continent which extends into higher latitude, South America, the winters are so mild that a snow cover cannot have long duration.

(E) Those streams which derive their water from rainfall, which flow regularly and which are higher in the coldest part of the year, but where the regular yearly change is insignificant.

This type dominates in central and western Europe; also, with some modifications, in the eastern part of the United States. It also exists on the western watershed of North America, north of 45° N. latitude; and in South America, south of 45° S. latitude. Similarly in New Zealand; but in these regions there appears an approach to Type B (snow melting in the mountains). This type partakes of the characteristics of Type D. The precipitation which occurs in the colder months is not everywhere dominant but it fills the streams the more because it occurs at the time of diminished evaporation. The streams of this type are best known; for example, many streams of Germany and England, the Mississippi, and particularly the Seine.

Although periodic changes in the height of the water are insignificant in these districts, floods are not infrequent, even far from the mountains, where there is the greatest danger. In calling attention to the valuable investigations of Wex, I wish to remark that deforestation of mountains and hill countries allows the water to run off too freely, and the dikes in lowlands again serve to confine the water within bounds. In so far as a stream derives its water from high mountains it inclines toward Type B. Such is the Rhine, which has its high water in summer because of the melting of the snow and glacier ice in the Alps even beyond Strassburg. But farther north Type E begins to dominate and at Cologne the maximum height of water occurs regularly in winter. In the uniform lowlands of northern Europe it is hard to discriminate sharply between Types D and E. One is in doubt whether to classify the Elbe and Oder under Type D or E, since

the winter snow cover is not regularly existent in their basins although it is frequent enough. The Vistula belongs to Type D, but with a mixture of Type B. The Danube occupies a very doubtful position. The lowlands belong to Type E; the Bavarian plateaus and the lower foothills of the Carpathians in Hungary and Wallachia to Type D; the Alpine regions to Type B. The Mississippi also occupies a doubtful position. The upper part of the basin is under the influence of the melting snows and the resulting high water occasionally meets in its descent to the lower part of the stream's course the high water from the Ohio and the Red, etc., which is the result of the spring rains. The tributaries which rise in the Rockies would give in summer much water from melting snow if the eastern slopes of the mountains were covered with abundant snow, which is not however the case.

(F) Rivers which derive their water from rain, are much higher in the colder parts of the year, and, in fact, exhibit a great difference between regular high and low water, while in summer some of these streams even dry up.

This type dominates in southern Europe. It is allied with the so-called tropical rains, *i. e.,* with a small amount of or even no rain in summer. When the summer—that is, the time of greatest evaporation—is so dry, the rivers have but very little water, except as they are supplied through the melting of snow in the mountains. In the winter, however, or in the spring and autumn, there is more water and because of the violence of the rains and the lack of forests, devastating floods are common. Who has not heard of the floods of the Arno and Tiber in Italy, the Loire, Rhone and Garonne in France, or in the province of Murcia in Spain? In France these misfortunes have led to the reforestation and turfing of the mountains, results comparable geographically to those exhibited in Venice. The greater part of Europe belongs to Type F with a partial mixture of Type B (snow-melting in mountains); the more rainy parts of central Asia and Persia (as also Fergana, Aderbeidschan); a large part of Asia Minor and Syria, north Africa from Tunis to Morocco, California, Oregon, Chile, northern New Zealand, and southern and western Australia.

(G) Deficiency of brooks and rivers on account of the dryness of the climate.

It is highly probable that no place on the earth is wholly without precipitation, but there are many in which precipitation is so scanty and irregular that no brooks and rivers are possible, at least no constant streams are possible. In such a region temporary brooks and rivers are formed after rain or the melting of snow, which either form pools and lakes that evaporate

quickly, or which are soon lost in the sands. Occasionally such a region is traversed by streams which have their sources in rainy areas and which receive no tributaries throughout the extent of the dry area, but, on the contrary, lose much water through evaporation. Examples are: the Nile, from 17° north latitude to its mouth; the Indus, below the mouth of the Satledsch; the Colorado, from 35° north latitude to the mouth of the Gila; the Volga, from Sarepta to its mouth. To the regions without rivers belong: the Sahara, part of Arabia, and the Aralo-Caspian depression, a large part of the lowermost inner plateau of Asia, large parts of the North American plateau eastward and also especially westward of the Rocky Mountains, the desert of Atacama and the desert region of South America between 18° and 30° south latitude, the Kalahari desert and neighboring desert areas of southern Africa, and lastly, a part of the interior of Australia. Mountains in deserts are generally an exception. Even in the Sahara there is a constant flow of water in the mountains.

A transition toward Type G is represented in places which have flowing water only in certain times of the year, and even then the quantity is not large. I shall designate this type with the capital letter H. The time is naturally during and after rain, and in climates with cold winters, during and after the melting of snow. Examples are: northern Crimea (in so far as it is not traversed by streams which rise in the mountains), a part of the Kirghis Steppes and the plateau lands of inner Asia, the steppes near the lower sources of the Kura and the Araxes, a belt south of the Sahara between 13° and 18° north latitude, and varying according to the longitude, where in summer the monsoon rains do fall, but are of too short a duration to result in constant streams, and finally, a number of regions in North and South America, and particularly in Australia.

Finally there are extensive regions without streams, but these are lacking through the operation of a wholly different cause than those discussed heretofore, that is, a more or less complete covering of snow and glacial ice. In this case the streams are replaced by the glaciers, which together with glacial streams, carry to the sea or to lower and warmer regions the excess of precipitation over evaporation. These I shall designate as Type I.

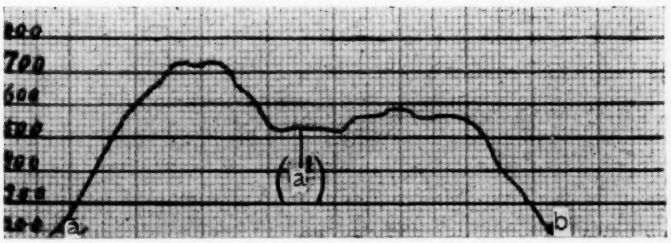
The latter condition occurs in a region of snow and ice covered mountains where the glaciers do not reach the sea; the former, in the case of those extensive fields of ice which cover islands and continents and extend to the sea. The best examples are Greenland in the northern, and the South Polar Continent in the southern hemisphere.

PLATE

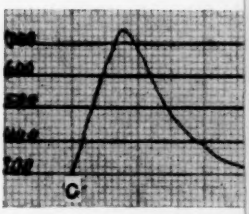
RATTLESNAKE MOUNTAIN, FARMINC

I A. Topographic Map

I B. 100 Ft. Contours, colored



I a. Longitudinal Section
Horizontal Scale, 1 inch = 1 mile
Vertical Scale, 10 inches = 1 mile (1 inch = 25 contours)



I b. Cross Section. Same S

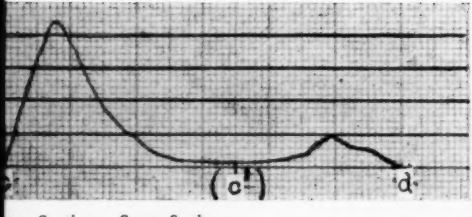
XUM

PLATE I.

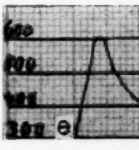
IN, FARMINGTON, MERIDEN QUADRANGLE

Contours, colored

I C. 100 Ft.

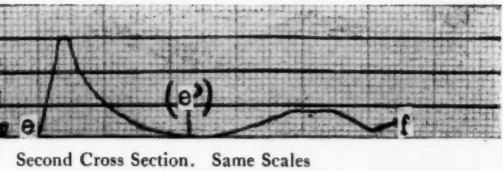


ross Section. Same Scales



I c. Second Cr

C. 100 Ft. Contours, uncolored



Second Cross Section. Same Scales

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PRACTICAL EXERCISES TO EXPLAIN THE TOPOGRAPHIC MAP

BY MARTHA KRUG GENTHE
Hartford, Conn.

A. Place of the work in the course of study:

THE intelligent use of topographic maps is the highest expression of a comprehensive and scholarly knowledge of the facts and principles of geography. It cannot, therefore, be expected of students before they possess a satisfactory working acquaintance with these facts and principles. Moreover, its explanation means such a continuous test of the pupil's ability to apply such acquaintance to the explanation of topographic features brought before him in the language of cartography, that no better opportunity can be found for reviewing, from entirely new points of view, the whole volume of geographic matter presented to him in a more or less systematic order in previous years. These considerations let the introduction of topographic map studies appear most suited for the last year of the public school work in geography, and there it ought to be made the keystone in the whole arch of this instruction.

B. Preparation:

The contour map is the highest, the most differentiated, the most scientific reproduction of surface forms. In order to be well understood it must be preceded in the curriculum by the lower, the simpler, the more elementary forms of such reproduction, and as no reproduction can be fully appreciated without an acquaintance with the original, the surface forms themselves must stand at the beginning of the work. (Outdoor study and the sand pan are the preparatory school of map study.) To the kindergarten and the early primary work belong the first observations of topographic facts, and their reproduction in sand or clay. After this the plan of the school room introduces for the first time the fundamental principle of cartography: maps show *where* things are, not the things themselves.

The next step, still belonging to the phase of home geography, will be the application of this principle to objects outside the schoolroom, viz. the translation of a model (of the school grounds, or of the school district) or of a plastic relief, into the language of cartography. First, location: "instead of putting the things themselves in their proper places, we will now put *signs* in the places where the things ought to be." Secondly, elevation: how this can be demonstrated has been shown in an earlier article in this magazine.[1]) Thirdly, upon graduating from home geography: the use of

[1] Journal of Geography, Vol. II, 1903, pp. 234, 235.

maps like those in the Natural and Dodge's Geographies which show elevations in accordance with the international color scheme. The innovation undertaken in the latter of presenting each continent and the United States in the two schemes: first by way of the current school geography relief map and secondly by way of the color scheme, will prove especially helpful for a better preparation of topographic studies.

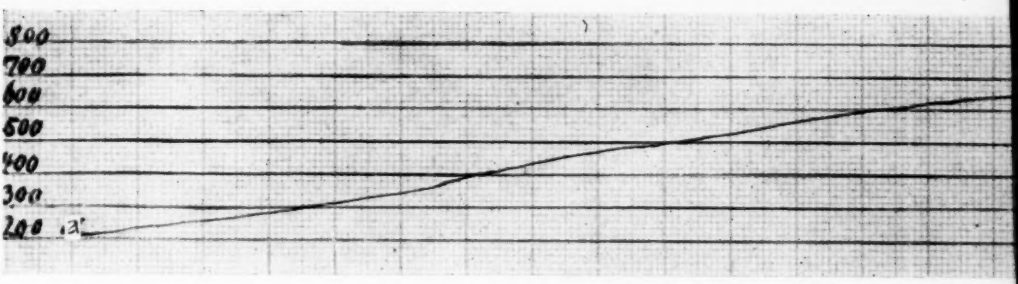
C. The work itself.

After such preparation in the lower grades the exercises in scientific topography will be a delight to both teachers and pupils. If they are fortunate enough to live in a place whose quadrangle has been published in the topographic atlas of the United States, the work will be started on that sheet, of course.

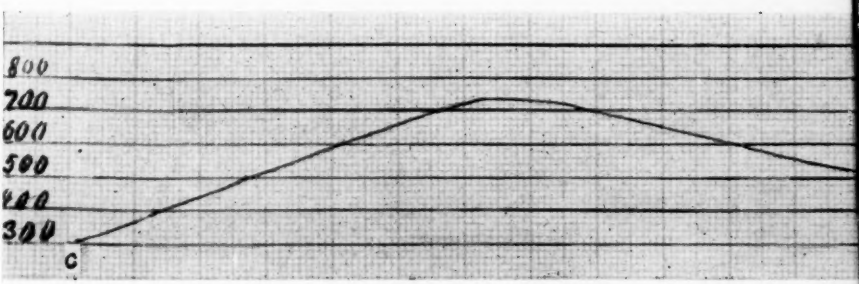
1. The difference between the physical (= colored contour) map of the text-book and the topographic sheet is one of degree, not of principle. The progress from the former to the latter requires therefore no new start, but can be effected by a natural and gradual transition.

If we should omit the colors on the text-book map, leaving nothing but the boundaries between the areas of equal coloring, the result of such omission would be a primitive contour map. Likewise, by coloring the areas of equal height on the topographic map, we should modify it into a very differentiated specimen of the familiar map of the text-book.

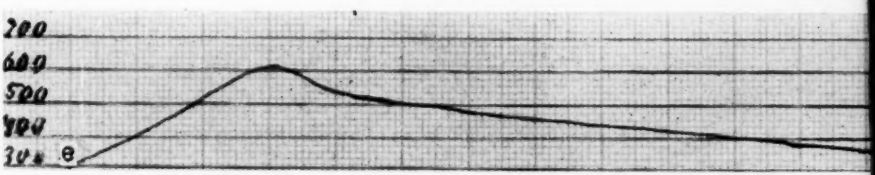
Then the connecting link between the two can be easily supplied. Let the teacher, at the expense of a little time, patience, and water color, transform the home quadrangle (or the most important part of it) into a colored contour map. After some experimenting even a novice in the art of painting can do it quite easily. The paper of the sheets is quite suitable for the purpose, only care must be taken not to allow the color to stand too long in one place, nor to start the painting of a second coating before the first is perfectly dry. The painting begins with the highest areas, and each preceding contour space is painted over again with every next lower one; in this way one shade of brown (of which a sufficient supply must have been prepared beforehand) will produce a scale of from six to ten different shades on the map. If the relief is little differentiated, the 100 feet contours present the most convenient boundaries for the different shades; but where altitudes are very high, it is wiser to make the distinction only at every 200 feet, or at even greater intervals. Where a great many shades are necessary, a different color can be taken for the valleys: green or yellow will do best for this purpose. In such a case, the limits of the two colors ought to be chosen before starting the painting, so that the change in color may correspond somewhat to a topographic change. Then after the brown is done,



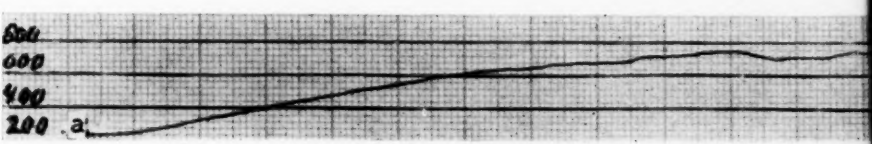
II a. Part of Section I a, in natural proportions. Horizontal and Vertical Scale 10 inches = 1 mile



II b. Part of Transverse Section I b, in natural proportions. Same scales



II c. Part of Transverse Section I c, in natural proportions. Same scales



II d. Profile I a, in natural proportions. Horizontal and Vertical Scales. 5 inches = 1 mile

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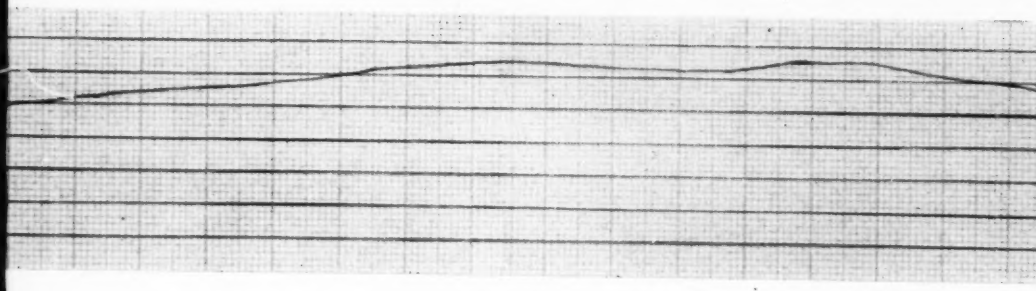
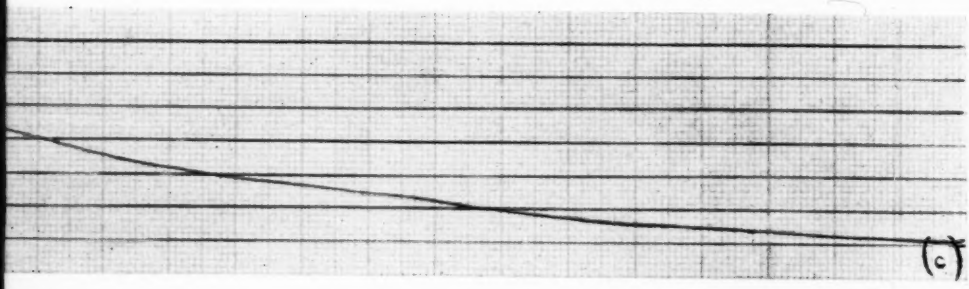
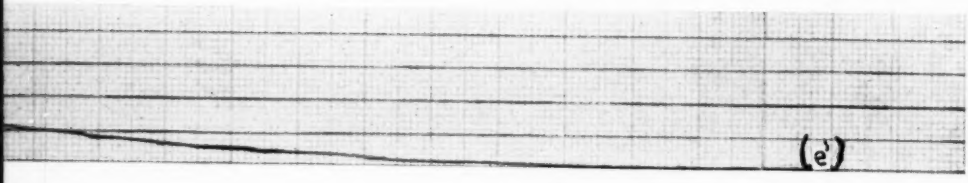
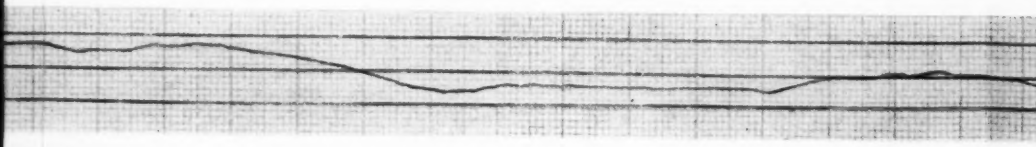
PLATE II.

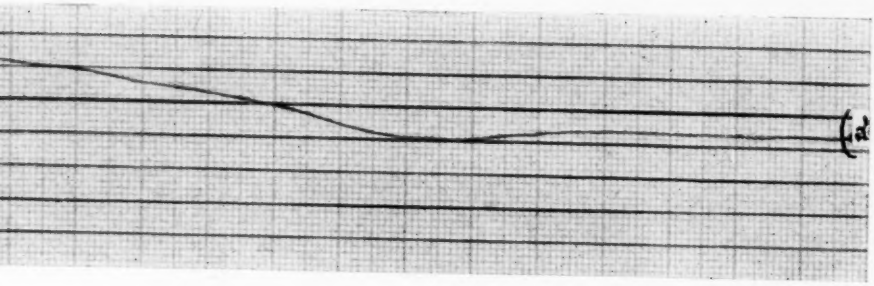


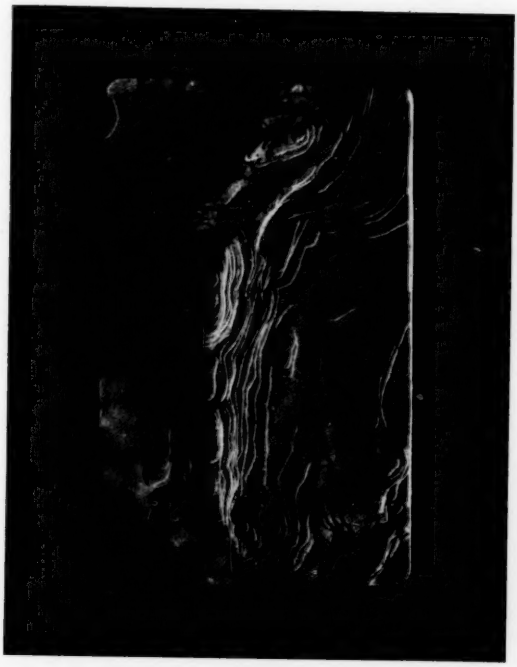




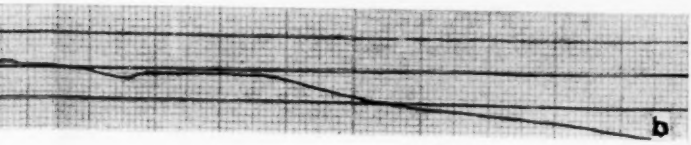


= 1 mile





II e. Cardboard Contour Model (contour relief map)



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the lower color is put on in the opposite way, viz.: painting first over all of the valley area and after this taking the lower and lower regions over and over again until the lowest places show the deepest green or yellow.

When confronted with the so modified sheet, as a very accurate and much specified map of the district [See Plate I, B], the child will easily understand its language. By locating objects which he knows: hills, water courses, villages, single buildings, roads, etc., and reading their heights (by hundreds of feet) by means of the color scale, he becomes familiar with the detailed application of the color principle. He recognizes that the system of expressing elevation used in his text-book is capable of an extension far beyond that of the text-book map and can be made to speak with an accuracy which almost equals actual conditions.

2. The next fact which must be brought home to him is that contour alone, without the coloring, suffices to express elevation. For this purpose, the teacher will make (on transparent paper, or by means of carbon paper, to save time) a copy of the colored sheet on which only the contour lines of the different shades appear. [Plate I, C.] Presenting the two maps to the class for comparison, he will, by the same exercises in location as under (1), make them familiar with the new appearance of a well known picture.[1] After some practice the question whether further differentiation is feasible will present itself quite naturally. Then the regular sheet with all the contours will make its appearance, and the explanation of the scale and of the conventional signs, the measurements of actual distances, heights, etc., can be entered upon.

3. Now the pupil can ascertain how far the map gives a true account of existing conditions. Armed with a tape measure let him, for instance, calculate the distance between two places which he knows and, allowing from fifteen to twenty minutes per mile, find out how long it would take to get from one to the other. If he has ever walked that way he will be delighted to see the scientific aspect of a familiar experience. Or let him find how long it will take to cover the same distance on horseback, by wheel, electric car, railroad, automobile. Choosing roads which run more or less smoothly at first, progress may be gradually made to sections of the map where the grades are steeper, and where allowance must be made for going uphill.

4. This leads to the determination of actual relief. A very valuable exercise in this line is the drawing of sections, either through a division of the map [Plate I, IB, IC; Plate IV, B], or through some prominent elevation

[1] If by mechanical multiplication a sheet can be provided for each child, so much the better. The expense will come only once, since the same sheet can be used for this purpose every year.

[Plate 1, IA; Plate III, II], along a cutting line given by the teacher. This is intended to give the pupil a feeling for the true proportions of surface forms which few people ever acquire without the scientific study of topography, thanks to the distortions of mountain lines which even in this generation have not yet entirely disappeared from popular books. By showing how untruthful are the majority of the sawteeth-like protuberances called mountains on certain pictures, such exercises will act as the most efficient corrective to the current overestimation of heights.

The exercise starts with a little arithmetic. If the horizontal scale is $\frac{1}{62,500}$, viz.: if 1 inch on the map equals 62,500 inches in nature, what height must we expect on the map between each two contour lines?

The contour interval represents 20 feet @ 12 inches each, or 240 inches. In the dimensions of the map, this would be $\frac{240}{62,500}$ inches, or 0.00384 inches, or, in a round figure, 0.004 inches, or $\frac{1}{250}$ of an inch. This means that, in correspondence with the horizontal scale, a vertical inch must cover 250 contour lines.

Twenty-five is about the limit of distinguishable lines on an inch space. In drawing our section we have therefore the choice between two ways (a) to preserve the horizontal scale of the map and allow the vertical to represent elevations ten times too high, or (b) to adapt the horizontal scale to the size of the vertical and make the section ten times as long as the space it covers on the map.

Either way is feasible; but (a) is easier because the distances of the map can be directly transferred to the diagram. An experiment which would make it very clear to the child how much the tenfold scale of heights distorts the actual proportions would be to copy one of these outlines on a piece of thin rubber and then pull the rubber lengthwise until the horizontal scale were equal to the vertical.

This is followed by (b) and the pupils must now be able to explain why here the shape of the mountain appears so vitally changed. No amount of labor ought to seem too great to be spent on this most important lesson. How instructive is, for instance, a comparison of sections IA, B, C on Plate 1 with IIA, B, C on Plate II! How well do the latter reproduce the steep western and the gentle eastern slopes of the famous Connecticut trap ridges! With similar experiences in their minds the children ought to remember ever afterwards that, although reasons of convenience generally make an exaggeration of the vertical scale necessary, no mountain ever looks like its 1:10 section, and to make a fairly correct estimate of natural proportions even from an overheightened diagram.

With a class well trained in mathematics the exercises may be varied

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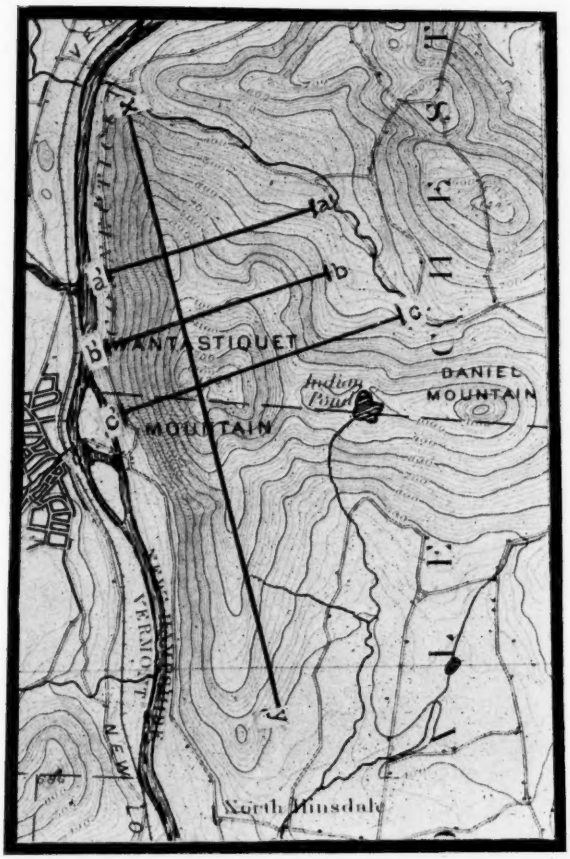
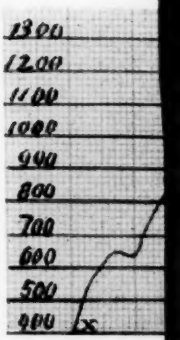
WANTASTIQUET MOUNTA

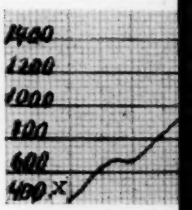


III A. Topographic Map

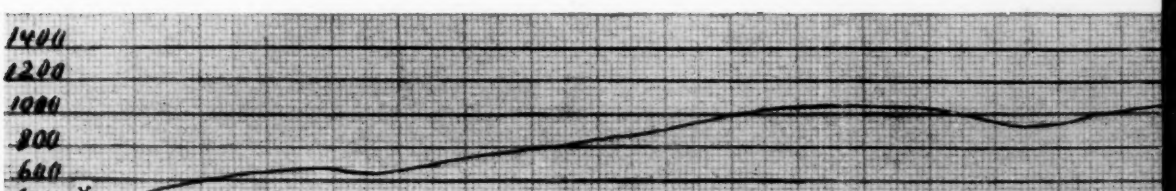
III B. Contour line Relief



I a. Longitudinal S



III. Same. Horizon

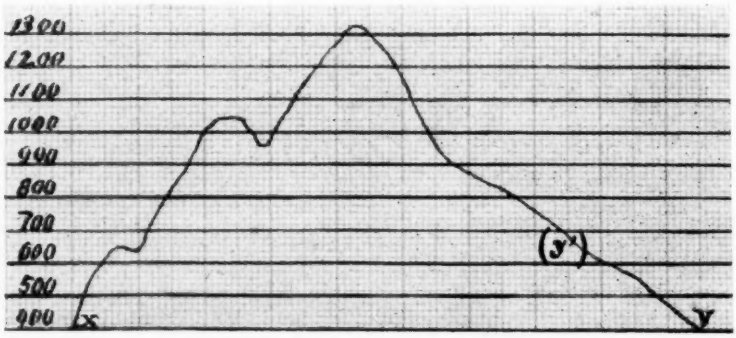


II. Part of Section I a, natural proportions. Both scales. 5 inches = 1 mile

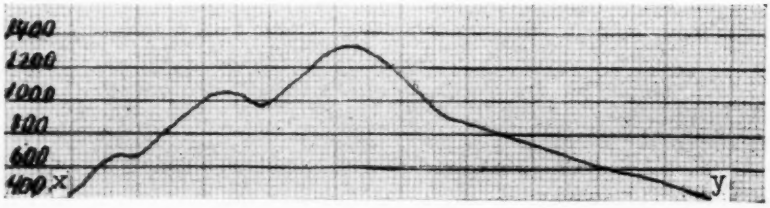
PLATE III.

WANTASTIQUET MOUNTAIN, BRATTLEBORO QUADRANGLE

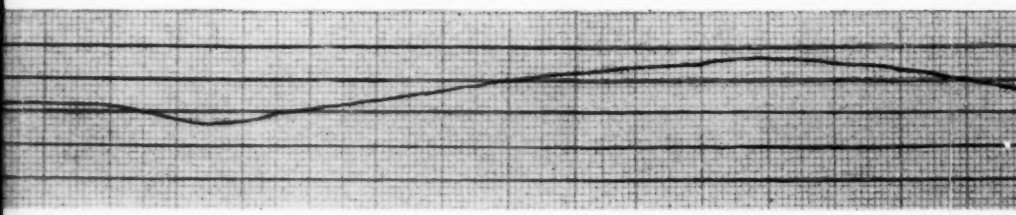
Relief

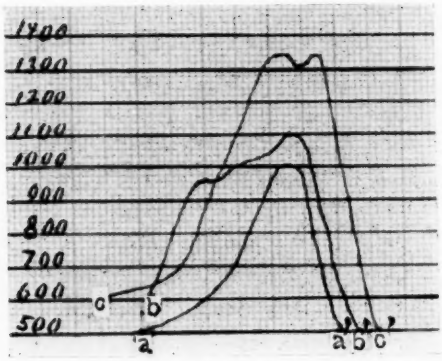


I a. Longitudinal Section, Horizontal. Vertical Scale = 1:10



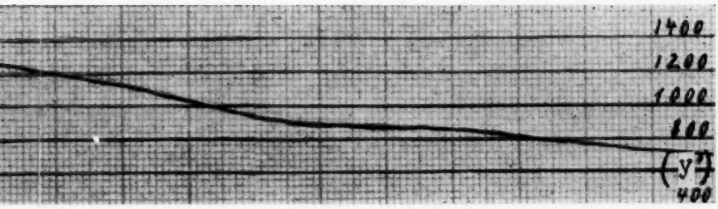
III. Same. Horizontal Scale 1:10; Vertical Scale 1:5





I b. Cross Sections. Same scales (looking south)

IV. Same in Contour line relief



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by drawing a section on an intermediate scale, five inches to the mile, for instance, in true proportions, by taking five inches for the horizontal mile and fifty contours on the vertical inch. In this way even comparatively long sections can be reproduced in true scale without wasting too many yards of paper. This is the case on the small, but very instructive Fig. d on Plate II. Everyone who knows the characteristic outline of Rattlesnake Mountain will recognize it at a glance on that diagram. Where even this scale requires more space than is convenient, as in Fig. II, Plate III, the horrors of Fig. Ia can be mitigated by reducing the heights at least to the 1:5 scale, as shown in Fig. III on the same plate. If the relief is much varied, as in the region represented on Plate IV, even a partial reproduction on the five-inch scale may show the characteristic features: Fig. BI on that plate demonstrates very well the monadnock-like elevation of the mountain above the gently rolling peneplain and in Fig. BII, same plate, the 1:5 scale affords a good contrast between the broad lowland, the fault line, the proud monadnock, and the monotonous upland.

5. A final exercise, and one which the children will greatly enjoy, is the making of a model based on the contour map. Cut in thin cardboard, of which no fewer than 25 sheets will be an inch high, the coutours of one prominent hill, mountain, or valley, cutting first along the contour lines on the map and after this placing the cut out piece on the cardboard and cutting out the latter along the edges of the pattern so obtained. Begin at the lowest contour, so that each following portion is smaller than the preceding and can be pasted on to the same in such a position as was the contour on the map. When you get to the top a perfect little mountain will be finished, from five to ten times overheightened, of course, but even so less distorted than a crude clay model would be. If you desire, you can fill out the spaces between the cardboard layers with some soft material, but this is not necessary. The mountain, when seen from above, will offer an aspect so much like that of the contour map that even the most obstinate adversaries of those maps will have to look for other arguments against them than their being too difficult for non-scientists to understand.

On this model the child can convince himself with his own eyes that where the contours come close together the slopes are steep, and that large contour intervals mean gentle slopes; that where contours are few and far between, the country is almost level; that parallel contours winding backward and forward in angle-like shapes mean valleys and ravines, etc., etc. Not a single phrase in the language of cartography need remain unexplained on a model of this kind.

After doing the work yourself, have the children do the same. It will

develop their skill and patience as much as their geographic conceptions. Plates 2, 3 and 4 show pictures of such models which were made by my students at Mount Holyoke College in a teachers' course. Even in the photograph they speak for themselves. The expense need not be in the way: at two cents apiece, one hundred sheets will supply many generations of pupils if different parts of the map are cut up every year.

6. After the home quadrangle has thus been thoroughly studied, other sheets, of localities which the children have not seen, are taken up and treated in a similar way. The making of the model need not be repeated, but some sections ought to be made of each map, and a correct idea of the general configuration of the country should be gained by measuring distances and heights, locating places of importance, and exploring the region in imaginary travels in all directions. The children must finally be able to tell, after a short inspection of a new sheet, whether the country is high or low, monotonous or varied, densely or sparsely populated, etc. The collections of typical sheets published by the U. S. Geological Survey[1] are especially valuable for the purpose; but there are, of course, hundreds of sheets besides these whose study is worth while, and one chosen from a neighboring region will often arouse more interest than one whose names are mere names to the children. As long as care is taken that enough variety be found in the forms represented on the sheets, any selection of sheets will do in the hands of a competent teacher.

7. Where a quadrangle of the home district is not available, the best start in the work would be made by using the colored contour map of the United States published by the U. S. Geological Survey, of which also an uncolored edition exists.[2] The latter must then be used as would the home quadrangle under 2 and 3; but for the exercises under 5 and 6 its scale is not large enough, and the section and model work must therefore be started right away on any other sheet whose topography is clear enough not to make the first steps in this path too difficult.

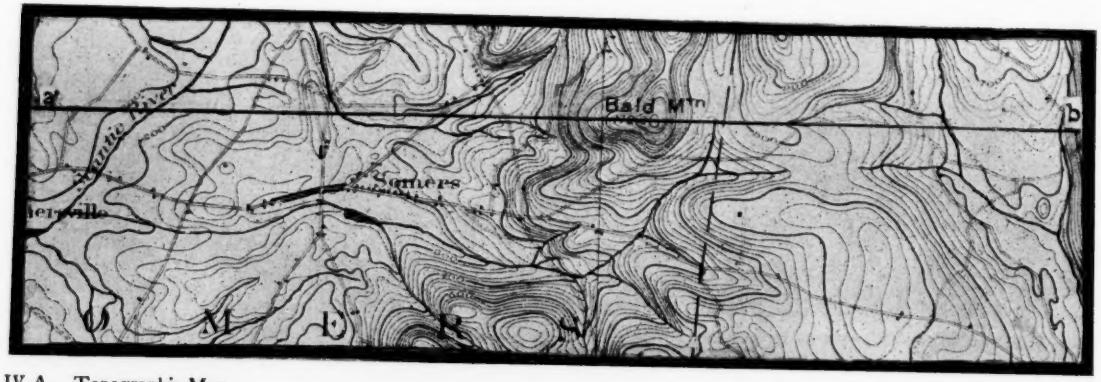
8. At the conclusion of the work a few remarks on the government office which furnishes these maps will not be out of place. The work of the U. S. Geological Survey is done for the people, and the people ought to know what abundance of geographical information is at their disposal for the asking, or at a trifling expense. The ignorance of large classes of the population concerning these things is appalling. But can we blame them for not knowing what they have never been taught?

[1] Topographical Folios, Nos. 1 and 2, by H. Gannett, 25 cents each.

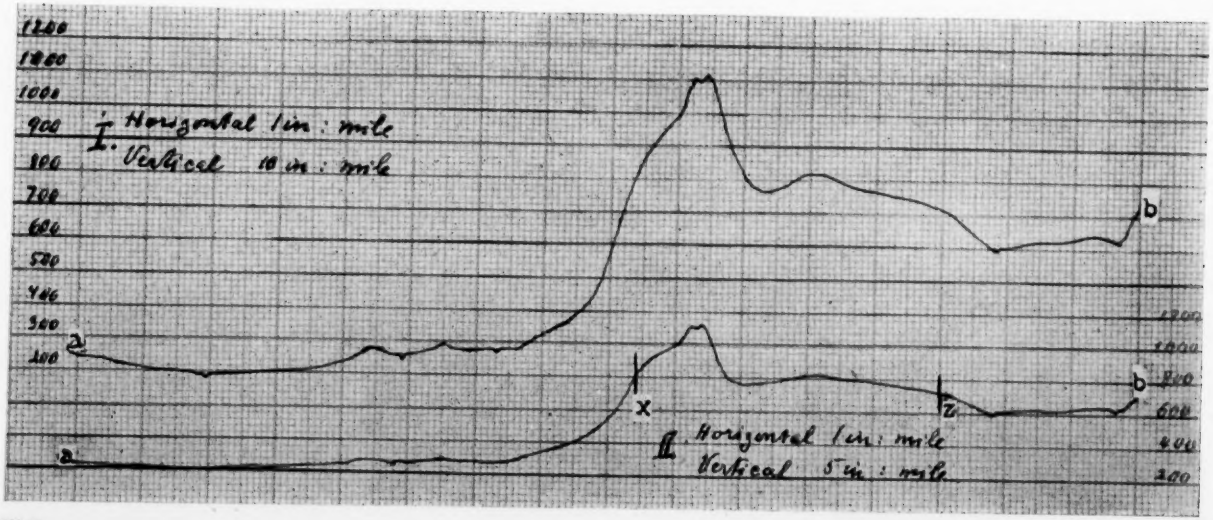
[2] Map of the United States, 18 by 28 inches, on a scale of 111 miles to an inch, price 10 cents; 100 or more, 4 cents each. Relief map (colored) and contour map (uncolored).

PLATE IV.

BALD MOUNTAIN, CONNECTICUT VALLEY AND UPLAND, TOLLAND QUADRANGLE

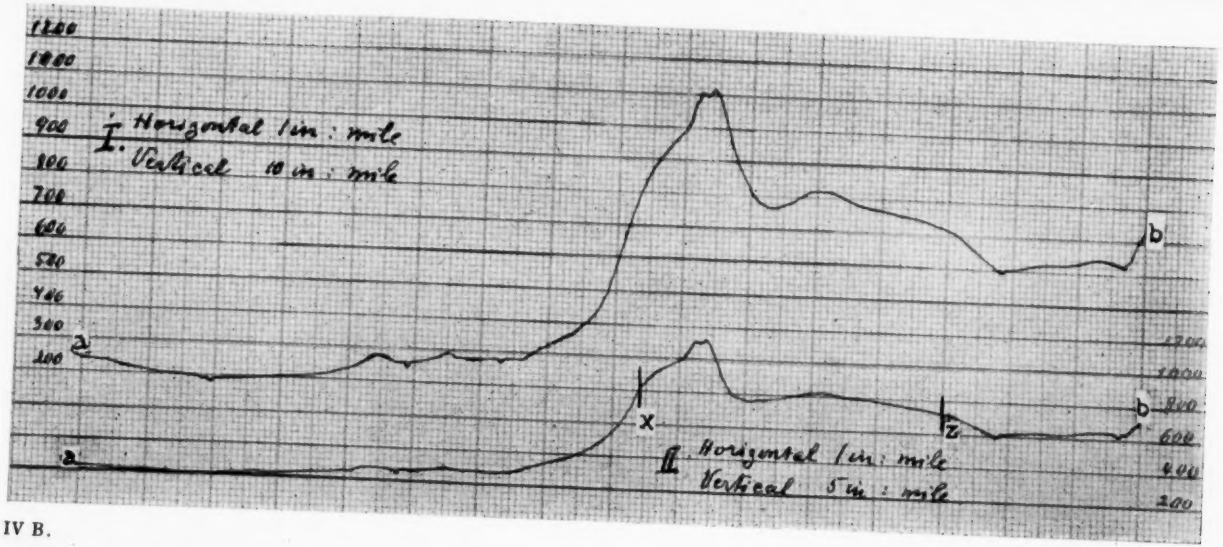


IV A. Topographic Map

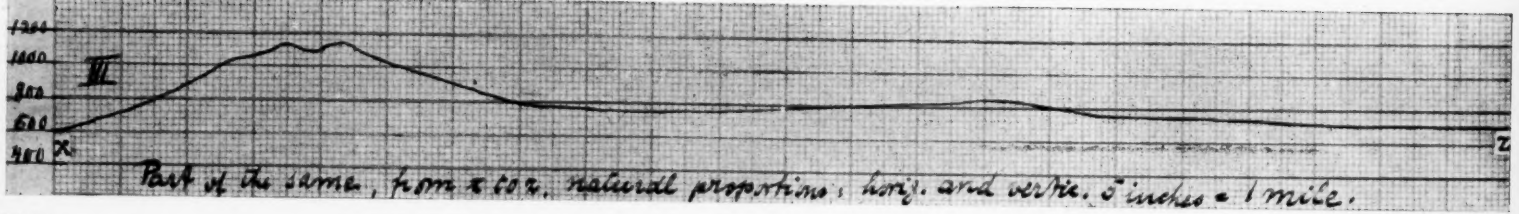


IV B.

IV A. Topographic Map



IV B.



IV B.

IV C. Contour line Relief

IV C IV. Sectional View of Contour line Relief (looking south). The curvature is due to the warping of the cardboard

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TRANSPORTATION—PART VI[1]

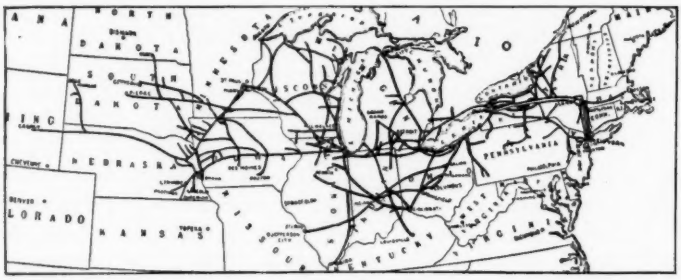
BY J. T. HOLDSWORTH
Drexel Institute, Philadelphia

FINANCIAL CONTROL

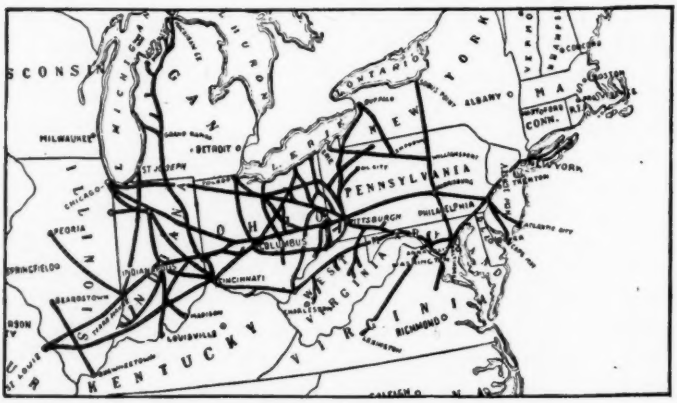
As a result of the rapid and far-reaching consolidations of the last few years a large part of the railway mileage of the country is dominated by a half-dozen groups of railway financiers, each of which practically controls a great system occupying a more or less distinct and exclusive territory. The chief of these syndicates or groups are the Pennsylvania, Vanderbilt, Gould, Harriman, Hill-Morgan and Moore systems. The Vanderbilt and Pennsylvania lines are all powerful in the trunk line territory, extending from the principal Atlantic seaports to Chicago and Mississippi points—the richest traffic region in the world. Both of the systems have practically double road connection between the seaboard and Chicago. The Baltimore & Ohio offers an alternative route to the Pennsylvania, while traffic over the Vanderbilt lines may go from New York to Buffalo by either the New York Central or the West Shore, and from Buffalo to Chicago by either the Nickel Plate or the Lake Shore. Moreover, these two great interests exercise joint control over the leading "coalers"—the Reading, the Chesapeake & Ohio, and the Norfolk & Western. The so-called transcontinental territory, extending from the Lakes and the Mississippi to the Pacific Coast, is divided between the Hill-Morgan roads—the Northern Pacific, Great Northern, and Burlington—at the north, and the Harriman lines in the middle and south—the Union Pacific and the Southern Pacific. Both the Hill and the Harriman systems have steamship lines from their Pacific termini to the Orient. The Gould properties reach out from St. Louis westward as far as Colorado and Utah by the Missouri Pacific and the Denver & Rio Grande; southward to the Gulf and the Mexican border by the Iron Mountain and the Texas & Pacific; eastward to the Lakes at Chicago, Buffalo and Toledo by the Wabash, and now, yet farther east to Pittsburgh and the seaboard at Baltimore over extensions of the latter system. The Rock Island system, controlled by the Moore interests, covers the grain and live stock regions beyond the Mississippi, and is especially strong in the Southwest.

Although these great systems own or control nearly two-thirds of the total mileage of the country, there are some independent roads that must be noted in this summary of the general railway situation. In transcon-

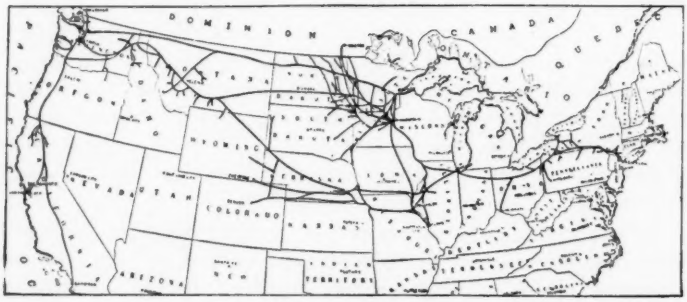
[1] Continued from Vol. IV, Page 173.



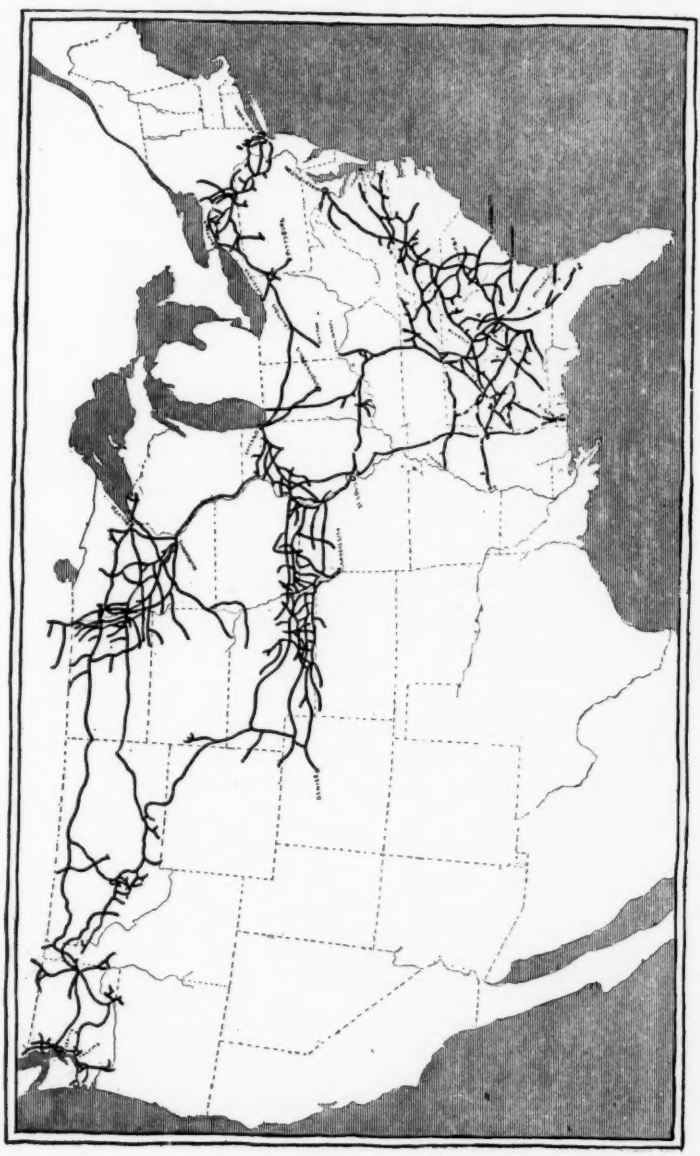
The Vanderbilt Lines



The Pennsylvania System
By courtesy of the American Monthly Review of Reviews

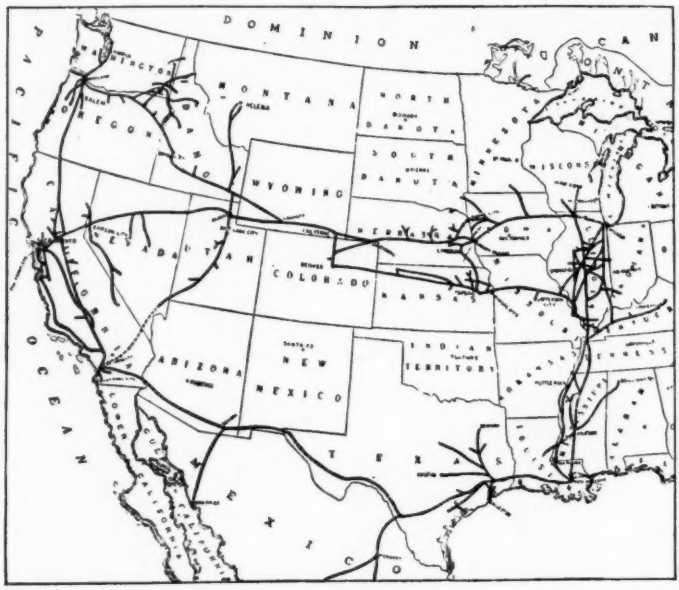


The Morgan-Hill System
By courtesy of the American Monthly Review of Reviews

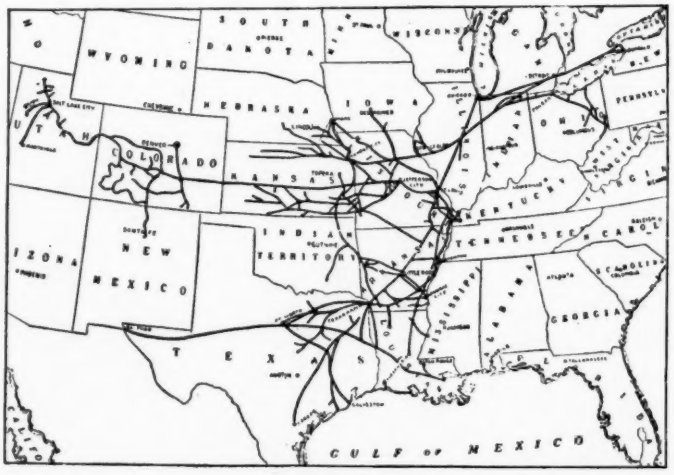


Courtesy of Public Opinion

The Hill-Morgan Lines

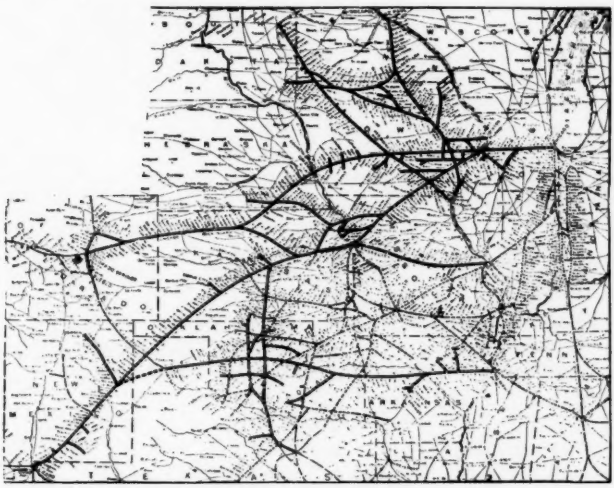


The Harriman System
By courtesy of the American Monthly Review of Reviews



The Gould System
By courtesy of American Monthly Review of Reviews

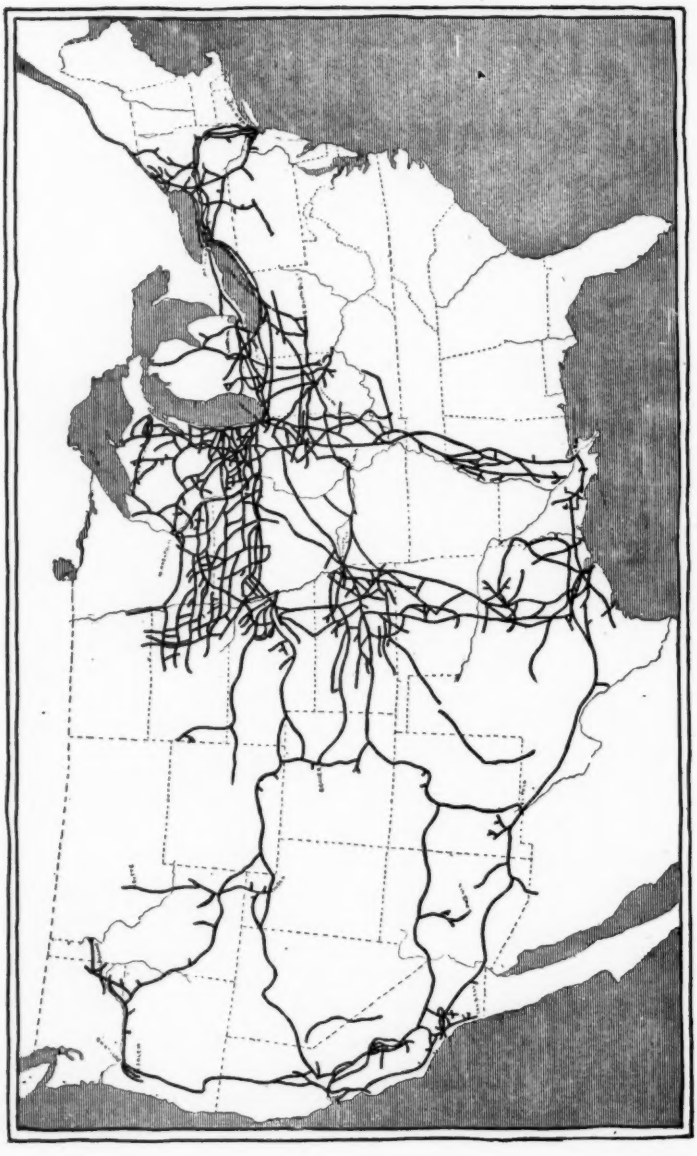
tinental territory, for example, the Santa Fé, stretching away from Chicago through Kansas City and Denver to the Pacific coast at San Francisco with southward lines to Galveston and El Paso, might in unfriendly hands prove a formidable rival to the dominant Harriman lines. The Standard Oil-



The Rock Island System

The Santa Fe Lines

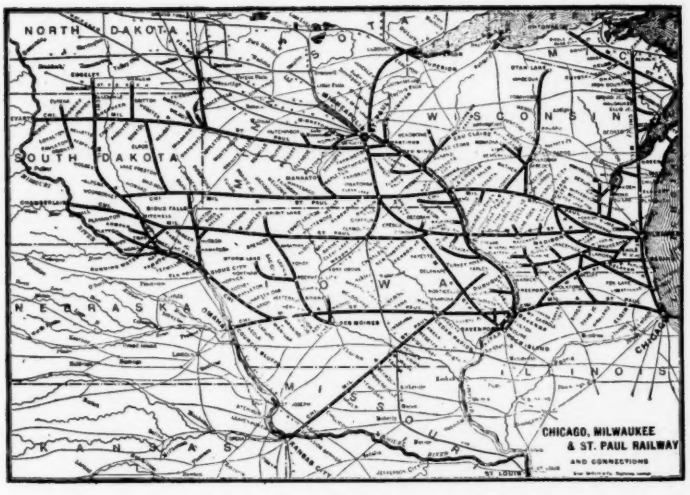
Harriman interests are reputed to have large influence in the control of the Atchison and for some time rumors have been afloat that the Pennsylvania is deeply interested in that road. Other lesser competitors in the Southwest are the Missouri, Kansas & Texas and the projected Kansas City, Mexico &



The Standard Oil-Harriman Lines

Courtesy of Public Opinion

Orient, to extend from Kansas City to Port Stillwell on the Mexican Pacific coast. In the Northwest the Chicago, Milwaukee & St. Paul, generally regarded as a Standard Oil road, divides the territory of that rich grain region with the Burlington and the Northwestern. The Illinois Central, occupying the fertile trough of the Mississippi Valley, and the Erie, paralleling the two giants of the trunk line territory, are generally classed as independents, though the Harriman and Vanderbilt interests have a voice in the affairs of the former and the Hill-Morgan influence is strong, if not dominant, in the latter. The recent merging of the Père Marquette, the Cincinnati, Hamilton & Dayton, and the Chicago, Cincinnati & Louisville has



brought into the Middle States another important independent. The Lehigh Valley, nominally independent, extending from the seaboard to Buffalo, exerts considerable influence in that part of the trunk line territory. New England territory is divided between the Boston & Maine, controlling the northern section, and the New York, New Haven & Hartford dominating the southern half. South of the Ohio and east of the Mississippi the territory is divided among the Louisville & Nashville-Atlantic Coast Line group, the Southern and the Seaboard Air Line. Here consolidation has proceeded more slowly, but absorption of the smaller roads by the few large systems is only a question of time. The Morgan interests control several of the Southern roads.

The Illinois Central

The following tables present a general summary of the leading railway groups:

	MILES
Rock Island System:	
Chicago, Rock Island & Pacific	5,604
St. Louis & San Francisco	3,947
Chicago & Eastern Illinois	751
St. Louis, Memphis & Southwestern	416
St. Louis & Gulf	265
Choctaw, Oklahoma & Gulf	1,174
St. Louis, Kansas City & Colorado	313
Choctaw, Oklahoma & Texas	203
Houston & Texas Central	690
Colorado & Southern	1,121
	14,484
Pennsylvania-Vanderbilt (joint control)	
Reading	2,145
Central of New Jersey	638
Chesapeake & Ohio	1,641
Norfolk & Western	1,721
	6,155
Hill-Morgan System:	
Great Northern	5,888
Northern Pacific	5,976
Chicago, Burlington & Quincy	8,739
Morgan Roads:	
Southern	7,137
Mobile & Ohio	912
Chicago, Indianapolis & Louisville	556
Cincinnati, New Orleans & Texas Pacific (jointly with C. N. & D.)	338
Atlantic Coast Line	4,557
Louisville & Nashville	6,133
Nashville, Chattanooga & St. Louis	942
Georgia Railroad	614
Central of Georgia	1,902
	23,091

	MILES
Vanderbilt System:	
New York Central & Hudson River	3,092
Boston & Albany	394
Rutland	415
Delaware, Lackawanna & Western	947
Lake Shore & Michigan Southern	1,702
Michigan Central	1,658
New York, Chicago & St. Louis	533
Cleveland, Cincinnati, Chicago & St. Louis	2,355
Lake Erie & Western	887
Pittsburgh & Lake Erie	127
Chicago & Northwestern	7,365
Chicago, St. Paul, Minneapolis & Omaha	1,676
	21,151
Harriman System:	
Union Pacific	2,963
Oregon Short Line	1,824
San Pedro, Los Angeles & Salt Lake	89
Oregon Railway & Navigation Company	1,152
Southern Pacific	8,933
Chicago & Alton	915
	15,876
Gould System:	
Missouri Pacific	3,892
St. Louis, Iron Mountain & Southern	2,215
St. Louis Southwestern	1,279
Texas & Pacific	1,827
Denver & Rio Grande	2,460
International & Great Northern	1,159
Wabash	2,485
Wheeling & Lake Erie	473
Western Maryland	258
West Virginia Central & Pittsburgh	162
	16,210

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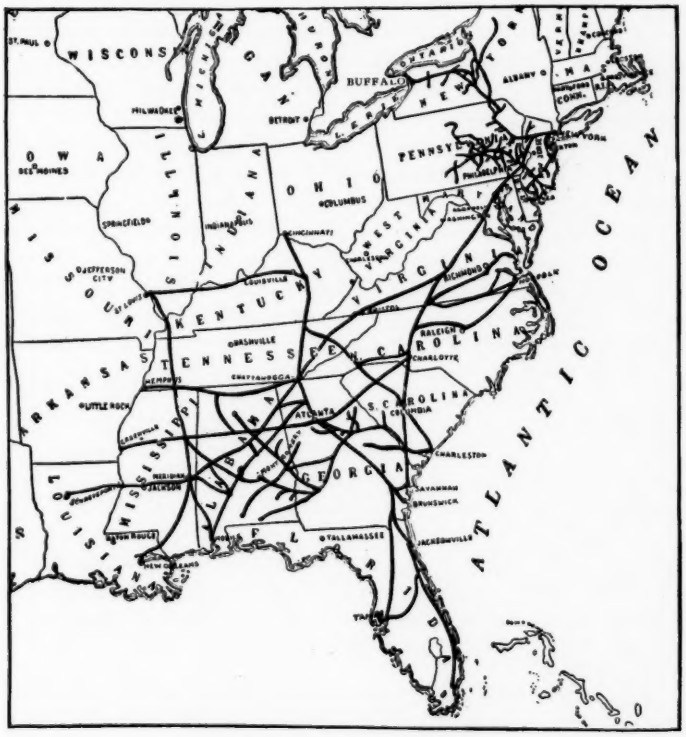
	MILES
Pennsylvania System:	
Pennsylvania Railroad (east of Pittsburgh)	5,822
Pennsylvania Company (west of Pittsburgh)	4,739
Baltimore & Ohio	4,438
Long Island	392
Grand Rapids & Indiana	590
Terre Haute & Indianapolis	659
	16,640
Leading Independents:	
Atchison, Topeka & Santa Fe	8,943
Chicago, Milwaukee & St. Paul	5,655
Illinois Central	4,301
Yazoo & Mississippi	1,162
Cincinnati, Hamilton & Dayton	1,015
Pere Marquette	2,195
Chicago, Cincinnati & Louisville	294
Boston & Maine	2,343
Erie	2,318
Lehigh Valley	1,399
New York, New Haven & Hartford	2,037
New York, Ontario & Western	548
Missouri, Kansas & Texas	3,043
Chicago Great Western	846
Kansas City Southern	839

Even the most general summary of the financial control of American railways would be incomplete without notice of the Rockefeller or Standard Oil interests. The Rockefellers are closely allied with both the Gould and the Harriman groups in the West, and with the Vanderbilts in the East. They are largely interested, also, in the New York, New Haven & Hartford, Ontario & Western, Lackawanna, Atchison, St. Paul, Delaware & Hudson, and other lesser roads. So closely have the railway interests of the Vanderbilts, the Rockefellers and Harriman been merged or identified that recent railway literature speaks of the Standard Oil-Harriman-Vanderbilt interests.

Another important figure in railway control is Edwin Hawley. The Minneapolis & St. Louis (642), Iowa Central (558), Colorado & Southern (1121), and the Wisconsin Central (977) are generally included in the list of Hawley roads, but control of the Colorado & Southern has probably passed to the Rock Island. Close community of interest obtains between the Hawley and the Rock Island groups, and in turn between the Rock Island and the Southern Pacific. Less conspicuous, but none the less powerful among railway financiers, are Jacob Schiff, of Kuhn, Loeb & Co., Speyer & Co., August Belmont & Co., and other leading banking houses. The extent to which banking interests have dominated railway policy and control in recent years is one of the most interesting and significant phases of railway development.

The group arrangement of the leading railroads suggested above must not be regarded as complete or irrevocably fixed. Community of interest, consolidation and absorption are still going on, and most, perhaps all, of the independents are likely, sooner or later, to fall under control of one or other

of the great groups named. These groups themselves are more or less mobile, and though the main lines and general trend of the railways of the United States are now pretty definitely laid, readjustments and new combinations are likely to occur before comparative permanence is attained. Not infrequently alarm has been expressed that the process of consolidation will



Territory of the Morgan System
By courtesy of American Monthly Review of Reviews

ultimately result in the concentration of all our railroads in the hands of a few non-competing groups, and that then shippers, consumers, the public generally, will be helpless in the grasp of the railroad monopoly. That the railway corporations are very powerful must be granted, and their far-reaching influence can not be gainsaid. Concentration of railway control in the hands of a few great groups has proceeded rapidly. The tables given above show that two-thirds of the total mileage of the railroads in the United

States are controlled by a half dozen groups of financiers. But control must not be confused with ownership. Each group of railway capitalists or magnates represents thousands of individual holders of railway stocks and securities. The insurance companies, savings banks, trust companies, educational and other institutions, are large owners of railroad stocks. The life insurance companies are the largest investors in railway property, and through them thousands of policy holders and their families are the real holders of railroad securities. Likewise, the savings banks, which are very large holders of railroad securities, represent the interest of thousands of wage earners in railroad ownership. It has been estimated that the holders of stocks and bonds issued by the railroads of the United States number over 1,000,000. Control by a few financial leaders or groups has been made possible through the stockholders delegating to them the right of voting the stock. This is a right which at any time the thousands of stock and bond owners may withdraw. Moreover, the railway legislation suggested by the President and debated in the last Congress gives evidence of a growing determination on the part of the people's representatives to limit the power of the railway corporations to a greater extent than ever before and to require that "the highways of commerce must be kept open to all on equal terms."

(*To be continued.*)

THE BEST ARE NOT TOO GOOD

Why should superintendents and school officers not take the same care in the selection of maps that they take in the selection of books? There is as much difference, or more, between a good map and a poor one as there is between a good book and a poor one. County superintendents could well include maps in their recommended lists for the county. The importance of accurate, up-to-date and well-made maps cannot be overestimated.—*The Nebraska Teacher.*

PROF. SHERZER'S GLACIAL STUDIES IN THE CANADIAN ROCKIES AND SELKIRKS

The Smithsonian Institution has just published a brochure by Professor W. H. Sherzer of the Michigan State Normal College at Ypsilanti that will be a great delight to future travelers along the Canadian Pacific Railway and a means of realizing much of the beauty and interest of glaciers to those who cannot visit them. The 45 photographs, some of which are superb, will help much in this realization. One misses maps a little but these forty-three pages are only a preliminary to a fuller report in which maps no doubt will find their place. It is to be hoped that this paper may find wide circulation among teachers and students of nature.—M. S. W. J.

GEOGRAPHY IN THE NORMAL SCHOOLS OF THE UNITED STATES*

BY CHARLES REDWAY DRYER
Terre Haute, Ind.

FUNCTION OF NORMAL SCHOOLS

THE public school system of the United States includes about 145 State Normal Schools, whose function, as generally defined in the act of establishment, is the preparation of teachers for teaching in the common schools of the state. By "common schools" are meant those in which the primary and grammar grades, comprising the first eight years of the school course, are taught. The "common branches," or those which are universally taught in the common schools, are reading, writing, arithmetic, grammar and geography. To these some states add human physiology, history, English literature, music, drawing, nature study and more rarely, algebra and Latin. The fundamental work of the Normal School is to give instruction in the common branches and in "professional" studies, comprising pedagogy and its various cognate subjects. Most Normal Schools also provide courses of study in some of the secondary, academic, or collegiate branches of learning, which may prepare students to teach in the public high schools.

STANDARDS OF ADMISSION

The nominal standard of admission to the Normal Schools is the completion of the eighth grade of the public schools, or the possession of a teacher's license obtained by the regular county examination. A few Normal Schools require a diploma from a public high school for admission, but usually special courses of study are provided for such students.

COURSE OF STUDY AND PERIOD OF ATTENDANCE

The Normal course of study required for graduation varies from one to five years, according to the rank of the student at the time of admission. For the majority of students the length of the course is four years. Probably, on the average, not more than one-third of the students admitted remain until graduation and something like one-half attend the Normal School only one year or less. The majority enter for the purpose of preparing themselves to obtain, for a limited period, higher grades of license and fair positions in the common schools, with no intention of teaching as a

*Read before Educational Section, Eighth International Geographic Congress, Sept., 1904.

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permanent occupation. Consequently the freshman or first year class is apt to be very large, and the ranks of the upper classes to diminish sometimes to one-fifth the number of freshmen.

POSITION OF GEOGRAPHY IN THE NORMAL SCHOOL COURSE

Geography, being one of the common branches and required for all grades of license to teach, falls, with few exceptions, in the first year of the course, and is taught to students who have had the least preparation. From the pedagogical or scholastic point of view, geography may be differentiated into two well marked varieties: (1) introductory geography, which gives in broad outline a general view of the world and its physical, biological and human activities, and serves as an open door to all the natural, historical and economic sciences; and (2) advanced geography, which comprises a synthesis and correlation of natural science, history and economics. It is evident that under the conditions which prevail in the Normal Schools, all but a small fraction of the geographic work done must be of the introductory variety.

LACK OF PREPARATION ON THE PART OF STUDENTS

For the Normal School teacher of geography a serious problem arises from the imperfection or absence of preparation on the part of the students. The state courses of study for the common schools include no more than four years of geography, which the child pursues between the ages of nine or ten and thirteen or fourteen. In many cases, by the downward intrusion from the high school of algebra, Latin or German, this has been reduced to three or even two years, and the child "finishes" geography at the age of twelve, when he is just beginning to be able to think. Ten or twenty per cent. of the high schools give a half year or a year to physical geography, but it is often very poorly taught by any teacher who happens to have a vacant period upon his programme. The high school course is usually a convenient period in which to forget the little geography learned in the grades. The result is that the knowledge of geography possessed by the average Normal freshman is difficult to evaluate. It may consist of a mixture in various proportions of blank ignorance, disjointed facts, parrot phrases, and less desirable pieces of pure mythology which stand in the place of scientific explanation. A most lamentable fact is that the geographic knowledge of the student lies so remote from his experience. He has wrestled with such problems as the change of seasons, the cause of tides, and rotational deflection at an age when it was impossible for him to understand them, and has never observed the path of Ursa Major or the varying points of sunrise and sunset. He is

apt to know something about Thibet, Abyssinia and the Amazon, and nothing about the hills, valleys and streams of his own neighborhood.

The school geography of forty years ago consisted largely of memoriter recitation of names and locations. This was often so thoroughly done that the child retained through life a very practical knowledge of general descriptive geography. If it were well done to-day, it would furnish a foundation for teaching scientific geography in the high and Normal schools. Memoriter learning has been largely abolished from the grade schools, but scientific learning has hardly begun to come in. The house is empty, swept and garnished and its last state is worse than the first.

PROBLEMS OF NORMAL SCHOOL GEOGRAPHY

The Normal School is called upon to undertake such large propositions in geography as the following:

(1) It ought to teach the student to read and use the technical language of geography as it is embodied in maps, and this ought to include the higher forms of that language, such as colored, nachured and contoured topographic maps, population, product and weather maps.

(2) It ought to teach a large part of the subject matter of geography. It is never safe to assume that the student possesses any particular portion of it. The subject matter ought to be so taught that the student may realize his concepts and build up in imagination true and adequate models of the features and phenomena of the globe.

(3) It ought to give the student some insight into the methods of scientific investigation and lead him to appreciate the meaning of natural or scientific causation.

(4) It ought to make clear the scope and organization of the science of geography and its relations to other sciences and subjects of study and to practical affairs.

(5) It ought to ground the student in rational methods of teaching geography to common school pupils.

In view of the magnitude of these tasks, perhaps criticism of the results of geographic teaching in Normal Schools ought to be more considerate.

STATISTICS OF NORMAL SCHOOLS

An attempt has been made to ascertain what the Normal Schools are actually doing in discharge of the heavy geographic responsibilities laid upon them, but with only partial success. An elaborate printed *questionnaire* addressed to more than one hundred Normal Schools brought but twenty-eight replies. The causes of this meager response may be left to conjecture. Partial information was obtained from the catalogues of thirty-two addi-

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tional schools. These sixty schools contain about one-half of all State Normal School students. They generally comprise the larger and presumably more flourishing schools in each state represented, and statistics compiled from them may give a somewhat flattering picture of Normal School geography in the United States.

THE COURSE OF STUDY IN GEOGRAPHY

The length of the course of study in geography has been computed on the basis of 180 to 200 exercises or periods per year. Of the sixty schools three devote one-fourth to one-third of a year to geography, fifteen one-half year, thirty one year, four one and one-half years, six two years, and two more than two years. The average course is a trifle more than one year.

In the attempt to determine the amount of emphasis laid upon the various phases of geography, the courses of study were classified as follows:

(1) Physiography, including an occasional term or semester of geology.

(2) Commercial geography.

(3) Pedagogical geography.

(4) General geography, comprising cases where no differentiation could be made out. Of fifty schools giving courses in physiography, fifteen devote to it one-third of a year, fourteen one-half year, thirteen two-thirds of a year, seven one year, and one more than one year.

Of thirty-eight schools giving courses in general geography, four devote to it one-fourth of a year, twelve one-third of a year, eight one-half year, five two-thirds of a year, five one year, three one and one-third years, and one two years.

Of sixteen schools giving courses in pedagogical geography, nine devote to it one-eighth to one-third of a year, four one-half year, and three two-thirds of a year.

Of nine schools giving courses in commercial geography, six devote to it one-third of a year, two one-half year, and one two-thirds of a year.

A summation of the aggregates of each phase gives to physiography twenty-nine years, to general geography twenty-three and one-third years, to pedagogical geography six years, and to commercial geography three and two-thirds years. The combinations of these phases in different schools are too various to be classified.

EQUIPMENT

The quality of the work done in Normal School courses can only be inferred from the equipment, preparation of the teacher and other indirect indications. Of twenty-eight schools reporting, five seem to have a fair equipment of maps, globes, pictures, models, lantern slides and specimens,

nineteen a good equipment, and four an excellent equipment. Ten have a geographical library of 100 volumes or less, fifteen have from 100 to 500 volumes, and three have more than 500 volumes.

Very few schools possess a specially fitted geographical laboratory, but this is not essential to good work which can be done in the class room or physical laboratory. Twenty-eight schools report some systematic laboratory work, of which twenty-three seem to give a fairly adequate course. Twenty-nine schools report regular field work, consisting of from three to six excursions for each class.

PREPARATION AND DUTIES OF TEACHERS

In forty-three schools one or more of the instructors in geography have had special university training. While in forty-seven schools the teachers of geography give instruction in other subjects, in twenty-eight of these geography is allied with some other natural science, usually physics or geology, in five with history, and in fourteen with some less cognate subject.

CONCLUSION

Fifteen years ago geography had hardly been thought of as a natural science and a geographical laboratory scarcely existed in dreamland. No special preparation was thought necessary for the teaching of geography, which was commonly turned over to the teacher of history, or to someone whose chief interests were more remote from the subject. The work consisted largely of a study of political divisions with some map drawing. There was seldom a suggestion that the vicinity of the school might contain geographical features worthy of attention. To one conversant with these facts, the present status of geography in Normal Schools is encouraging. A professional school can hardly be expected to take the lead in promoting a branch of common education elsewhere neglected. As long as only three or four universities in the United States offer substantial courses in geography, teachers with university training in that subject will not be plentiful. In the common and high schools the supply of geography teachers who are as well trained as those in mathematics, languages or history, will await the demand.

While the teaching of geography in the Normal Schools is far from adequate, it is entering upon a new phase in which trained teachers and scientific methods will prevail. Progress is being made and there does not seem to be any occasion for the common schools, high schools or universities to throw stones at the Normal Schools upon this score. There is a fair prospect that the demand and supply of competent teachers of geography, both hitherto very small, may increase at a reasonable rate.

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THE FALL LINE

BY EDITH A. DIETZ
Barnard College, New York City

ONE of the chief geographical determinants of the position and success of many cities in the Middle Atlantic States is the so-called Fall-line which marks the boundary between the Piedmont region and the Atlantic coastal-plain. This line extends from the mouth of the Raritan River in northern New Jersey clear to the Gulf States, where it gradually fades out.[1] At every point where the eastward-flowing Appalachian streams pass from the hard and highly-tilted crystalline rocks of the Piedmont belt to the soft, unconsolidated sands and clays of the emerged portions of the continental shelf, *i. e.,* the Atlantic coastal plain, falls and rapids of varying height occur. Hence the line which joins the points where falls occur on successive large rivers is called the Fall-line.[2] In the northern part of the plain, the Fall-line occurs just at tide-level, sometimes within the Piedmont. On the Delaware it is two miles above the margin of gneiss rocks, at Trenton; on the Schuylkill it is three miles above the easternmost outcrop of granites and schists.

The history of the development of the fall-line, or fall-zone as it ought really be called, as it is often several miles in width,[3] has been briefly this: Before the elevation of the present coastal plain, while its strata of Mezozoic and Cenozoic formation were being laid down on the submarine outwash of the Appalachian Old Land, the rivers had their mouths far above where they are now situated, and near the inner margin of the present plain, so there was practically no fall-line. Now that the plain has been elevated the rivers have deepened their channels in it more than in the crystalline rock of the Piedmont, making the transition from one to the other distinctly visible. As long as 75 years ago a state geologist attributed this line of falls to the hardness of the foundation rock of the Piedmont.[4]

On one side of the fall-line lies the coastal plain with its rich soils, muds and alluvial deposits, cut to a limited depth by the great rivers which cross it, its low relief, determined entirely by its hydrography,[5] its smooth, sluggish yet navigable rivers often mere tidal canals and estuaries.[6] On the

[1] U. S. Geological Survey 1885-6, pp. 548-549.
[2] Davis, Physical Geography, p. 1-34.
[3] Report Maryland Weather Service, Vol. 1, p. 116.
[4] U. S. Geological Survey 1885-6, pp. 548-549.
[5] U. S. Geological Survey 1885-6, p. 549.
[6] Maryland Weather Service, Vol. I, p. 112.

other, the more or less rough or rolling Piedmont upland distinguished by its geological formation and its topography. It is composed of hard rocks of uneven surface, due to long-continued erosion and gradually rising, it merges imperceptibly into the Appalachian ridges. Its streams, running over rock bottoms, are far swifter and clearer and more diversified by rapids and reaches.[1]

Starting, as I mentioned before, at the northern end of New Jersey, the fall-line is crossed by many rivers; of these the largest and most important are the Delaware, the Schuylkill, the James, the Potomac, the Roanoke, the Rappahannock and the Savannah. Situated where these rivers cross the series of slight faults with eastward downthrows, which cause the fall-line,[2] are such cities as Trenton, Philadelphia, Port Deposit, Baltimore, Richmond, Raleigh, Columbia, Augusta and Macon. Practically every city south of New York which is of great commercial importance, except Charleston and Savannah, which are seaboard towns, is situated along this lone. Thus the boundary of the Atlantic coastal plain is marked on nearly every large river by an important city.[3]

There are a number of conditions which, combined with the splendid water-power furnished by these rivers which cross the fall-line, have functioned in the development of the above-mentioned cities. Almost first in importance is the association of the up-stream limit of navigation. In the case of the Delaware, Susquehanna, Potomac and James Rivers, navigation is possible to ocean-going vessels up to the fall-line.[4] Further south this combination is less prevalent, largely because of the greater width of the coastal plain, which is over 100 miles wide at Raleigh, North Carolina; partly because the smaller volume of the rivers, which, south, drain only the plain and eastern slope of the Appalachian highland, while in the north they cross the mountain-barrier. Obviously manufacturers who have direct connection with the sea, especially those whose products are bulky in comparison to their weight, like the producers of pig-iron, have a great advantage over those who must transport by rail to the coast. It is estimated that the opening of the canal between Birmingham, Ala., and Mobile Bay will reduce freight charges 80 per cent. to manufacturers of iron and steel in that region.[4] Again, the general character of the two areas which adjoin the fall-line contribute largely to its importance.[5] The Piedmont furnishes

[1] Report Maryland Weather Service, Vol. I, p. 175.
[2] *Ibid*, Vol. I, p. 116.
[3] Davis, Physical Geography, p. 156.
[4] Census Bulletin 1901, section of Alabama Manufactures.
[5] Davis, Physical Geography, p. 134.

minerals, iron, building-stone, slate, which are rendered accessible in some places by the cutting which the entrenched streams have done along the fall-line.[1] At Port Deposit and Jones Falls, Md., are extensive quarries of granite and gneiss. In both places, the streams not only help to uncover the rock and drain the quarries, but also to transport it to the coast.[2] The level coastal plain with its rich deep soils offers quick profits to the raiser of fruits and vegetables in the northern part, of cotton and tobacco in the southern, while the even topography permits of numerous railway lines. Throughout the section, but more especially in the south, there are the added advantages of nearness of raw materials and cheap labor to the centers of manufacture. It is against these two factors that the New England cotton mills are fighting what is in some cases a losing battle. Within the last few months the stockholders of the Booth mills, of Lowell, Mass., one of the oldest concerns in the country, voted to liquidate. Their failure was ascribed in great measure to the growing competition of southern mills. Southern merchants formerly went north for the goods which are now manufactured more cheaply at home, and the raw cotton which was once shipped north to be made up for foreign trade is now being sold from the south direct to Japan and China.[3] In the last decade the Southern States have trebled the capacity of their mills. At present there are over 300 mills situated near or in cotton fields along the fall-line from Virginia to Alabama, and the increase in the amount of capital invested in southern cotton mills from 1890 to 1900 was 131.4 per cent.[4] The southern mills have had the added advantage of being established in recent years, with corresponding improvements, some of which have not yet been introduced in the north. The first factory operated wholly by electricity, without belts or shafting is located in the south.[5] This method permits of the factory being placed on high ground away from the stream, thus securing accessibility and healthfulness. This operation of textile plants by electric currents derived from water power at a distance accounts largely for the apparent decrease in use of water, from one-half the total motive power used in the United States to about one-sixth, which was noted in the last census.[6] In North Carolina the increase in use of water was 20,050 horsepower, or 79.2 per cent.; in Georgia and New Jersey it was respectively 43.8 per cent. and 41.5 per cent.[7]

[1] Gilbert and Brigham, Introduction to Physical Geography, p. 69.
[2] Maryland Weather Service, Vol. I, p. 147.
[3] Adams, Commercial Geography, p. 87.
[4] Census Bulletin 1902, Manufactures, p. 14.
[5] *Ibid.*, p. 13.
[6] U. S. Census 1900, Vol. VIII, p. 133.
[7] *Ibid.*

Of the fifty millions invested in cotton manufacturing in seventeen Georgia towns, Augusta controls ten millions and Macon six millions. The increase in the value of cotton goods produced by South Carolina from 1890 to 1900 was $20,123,120, while the increase in North Carolina during the same period was $18,809,355. Of the seven advantages named in the census as causes for the successful localization of industries, the Southern States possess as regards cotton, five, *i. e.,* nearness to raw materials, accessibility to markets, waterpower, favorable climate and supply of cheap labor. Of the Virginia fall-line towns, Richmond is the most favorably located for it has an abundant supply of tobacco at its doors, a climate well suited to the handling of the leaf,[1] cheap labor, and the James River, which is navigable by large vessels and also furnishes abundant water power, for it falls nearly fifty feet at Richmond.[2] So favorable are all conditions to tobacco manufacture that large quantities of Connecticut, Pennsylvania and Havana leaf are brought into the state to be made into cigars. In 1890 there were 296 establishments capitalized at $10,536,198.[3]

From the time of the early settlements in Maryland the abundant water power furnished by the streams of the Piedmont has been applied first to grist and saw mills and later to the manufacture of textiles, cotton, wool and knit goods, and wood pulp.[4] Of these, cotton manufactures, especially that of cotton duck in Baltimore is most important. Another factor besides location on the fall-line, which has aided in the success of Baltimore is its position near a region famous for its fruits and vegetables as well as its oysters. All these products are canned extensively, in fact Maryland leads in the canning of oysters, tomatoes and peaches.[5]

Pennsylvania, on account of its abundant supply of fuel, coal, natural gas, timber, has used waterpower less extensively than almost any other state; at present waterpower represents only 4.6 per cent. of the total power used and is confined largely to grist and lumber mills, paper and wood pulp manufacture,[6] which are not Pennsylvania's chief products. The importance of its fall-line cities is due mostly to their position at the head of navigation on large streams and on north and south railway lines.[7] The state ranks first in the manufacture of carpets, with 48 per cent. of the total product of the United States, second in wool manufacture with 21.4 per

[1] Census Bulletin 1902, Virginia Manufactures, p. 5.
[2] U. S. Geological Survey 1885-6, p. 549.
[3] Census Bulletin 1902, Virginia Manufactures, p. 5.
[4] Maryland Weather Service, Vol. 1, p. 146.
[5] Census Bulletin 1902, Maryland Manufactures, p. 22.
[6] *Ibid.,* Pennsylvania Manufactures, p. 4.
[7] *Ibid.,* p. 2.

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cent. of the total for the United States, and second in hosiery, worsted and knit goods with 22.9 per cent. of the total product for the United States. Philadelphia is first in all of these manufactures, in fact carpets and woolen goods are restricted almost entirely to that city, and their establishment there antedates the Revolution.[1]

Philadelphia's importance in shipbuilding is due to its proximity to the great iron manufacturing establishments of the state, to the depth of the river close to the shipyards and to mild winters which allow outside work on vessels.[2] Next to the River Clyde in Scotland, the Delaware is now the greatest shipbuilding stream in the world. More of our government vessels are constructed at Philadelphia than at any other point. However, the commercial importance of Pennsylvania is largely due to its iron and steel manufactures located in the central and western parts of the state on the Allegheny plateau.

One important factor in the progress of Trenton, New Jersey, beside its position on the fall-line, and at the head of navigation on the Delaware is the presence of fine pottery clays in the vicinity. Almost the first attempts to produce in this country anything except the coarsest granite ware were made at Trenton.[3] From the establishment of the industry there in 1857 experiments were made with finer glazes. The success of exhibits of ivory porcelain and Parian vases made in Trenton factories at the centennial of 1876 greatly stimulated this industry. Higher grades of China of more artistic shape and finer glaze were soon made in many other factories and the success of Trenton pottery was established.

Although it is true that waterpower as a factor in manufacturing is generally decreasing in importance, and therefore mere location on the fall-line would not secure or maintain commercial importance for a city, it is obvious that in most cases, location on that line is connected with many advantages not found together elsewhere, and that the fall-line cities of the Atlantic slope will continue to maintain their present commercial importance.

[1] Pennsylvania Manufactures, p. 9.
[2] Census Bulletin 1902, Pennsylvania Manufactures, p. 15.
[3] Census Bulletin 1902, New Jersey Manufactures, p. 8.

SYLLABUS FOR PHYSIOGRAPHY IN THE HIGH SCHOOLS OF NEW YORK CITY*

THE accompanying outline includes only the most essential principles and facts of physical geography, which must be studied in the classroom, laboratory, and field. While the order of presentation is not essential, the order given is logical, and is found to be good. The syllabus here given meets the requirements of the College Entrance Examination Board. Consideration is also given to the needs of the large number who do not go to college. Throughout the course, the subject is considered both from its scientific and economic aspects, and should be given at least one laboratory period each week. No general topic should be dismissed without a consideration of its human interest.

The candidate's preparation should include:

1. The study of a standard text-book, for the purpose of gaining a knowledge of the essential principles and facts of physical geography.
2. Individual laboratory and field work to the amount of at least forty counts, selected from a list not essentially different from the accompanying list.
3. Instruction by lecture-table demonstrations, and lectures illustrated by stereopticon views.
4. Collection and study of pictures illustrating the various phases of the subject.
5. Supplementary reading or library work, involving the report in class of the investigation of topics assigned by the teacher.

The attention of teachers is particularly called to the wealth of material available for study in the various museums of the City of New York, especially in the Natural History Museum, Eighth Ave. and 77th St.; also to the magnificently colored Bickmore slides, more than three hundred of which have been selected for use in teaching physical geography. Teachers who have not yet begun to equip their physiographical laboratories will find, by consulting the City School Supply Lists, that a very complete equipment is available.

THE EARTH AS A PLANET

1. ORIGIN:

   Solar system, relation to other planets, Nebular Hypothesis.

2. SHAPE:

   Evidences, consequences.

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3. SIZE:
   Methods of determining, consequences.
4. MOTIONS:
   Rotation: Axis, poles, rate, direction, consequences.
      Inclination of axis: Sidereal, solar, and lunar day.
   Revolution: Path, direction, rate.
      Change of seasons;
      Variation in length of day and year.
5. LOCALIZATION OF PLACES:
   Latitude:
      Determination of, and length of degree.
   Longitude:
      Determination of, length of degree, prime meridian.
   Time:
      Determination of local noon, and north-south line;
      The beginning of the conventional day;
      International date-line.
6. MAGNETISM:
   Magnetic variations;
   The mariner's compass.
7. MAPS AND MAP-PROJECTION:
   Uses and interpretation of maps;
   Common forms of map-projection;
   Relief maps: models, contour maps, hachure maps, color-relief maps.

THE AIR

1. PROBABLE ORIGIN.
2. COMPOSITION AND PROBABLE REASONS FOR.
3. FUNCTION OF AIR AND ITS SEPARATE CONSTITUENTS.
4. PRESSURE AND DENSITY:
   Measurement: mercurial barometer, aneroid barometer, barograph;
   Relation of pressure to altitude—probable depth of air;
   Variation in pressure; isobars, barometric gradient;
   Isobaric charts: cyclone and anticyclone.
5. TEMPERATURE:
   Source of heat;
   Insolation, and relation of insolation to temperature;
   How the air is heated and cooled;
   Measurement: thermometers, thermograph;

Distribution, determined by:
Rotation and length of insolation period;
Angle of insolation;
Character of surface;
Distance from sun.
Heat belts and areas: tropical, temperate, frigid;
Variation in temperature; isotherms, temperature gradient;
Isothermal charts: heat equator, cold pole;
Relation of temperature to pressure;
Relation of temperature to altitude: vertical temperature gradient (v. t. g.).

6. MOVEMENTS OF THE AIR—WINDS AND CURRENTS:
Inauguration of movement—theoretical explanation;
Classification of winds: planetary, terrestrial, continental, land and sea, mountain and valley, cyclonic;
Causes and consequences of each class;
Migration of terrestrial wind-belts—monsoons;
Progressive movement of cyclones and anticyclones;
Movement of winds about cyclonic and anticyclonic centers;
Change of temperature in ascending and descending currents—adiabatic gradient;
Winds classified as to velocity: light, moderate, brisk, high, gale, hurricane;
Measurement of wind velocity: anemometer.

7. HUMIDITY OF THE AIR:
Source of moisture: evaporation;
Amount of moisture present: absolute humidity, relative humidity, saturation or dew-point;
Measurement of relative humidity: hygrometer;
Condensation of moisture:
Clouds: cirrus, stratus, cumulus, nimbus;
Dew and frost: relation of dew and frost to winds and clouds;
Precipitation (rainfall): rain, snow, hail, sleet;
Measurement of rainfall: raingauge;
Distribution of rainfall: deserts, semi-arid regions, well-watered regions;
Effect of mountains upon distribution;
Cyclonic, tropical, and monsoon rains;
Relation of rainfall to life and human industries;
Relation of temperature to humidity.

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8. WEATHER AND CLIMATE:
   - Weather and climatic elements:
   - Weather and climatic controls: latitude, altitude, distance from the sea, position with reference to mountains, to wind belts, and to prevailing paths of "highs" and lows";
   - Climatic belts and regions;
   - Man's relation to climate.
9. WEATHER MAPS:
   - Construction and interpretation;
   - Weather forecasting—its benefits;
   - Area of precipitation in cyclone;
   - Shifting of winds as determined by passing "high" or "low";
   - Direction of wind most apt to bring rain; fair weather.
10. ELECTRICAL AND LIGHT PHENOMENA:
   - Lightning, the Aurora;
   - Rainbow, coronas, halos;
   - Colors of the sky;
   - Looming and mirage.

THE SEA

1. AREA, DISTRIBUTION, USES, ADAPTATIONS;
2. COMPOSITION AND DENSITY OF SEA-WATER;
3. EXPLORATION OF THE SEA: SOUNDING AND DREDGING;
4. DEPTH OF THE SEA: MAXIMUM AND AVERAGE;
5. TEMPERATURE OF THE SEA: HOW ACQUIRED, AND HOW DETERMINED;
   - Horizontal and vertical variation in temperature;
   - Temperature of deep equatorial seas accounted for;
   - Temperature of deep mediterraneans accounted for.
6. MOVEMENTS OF THE SEA:
   - Waves: wind waves, earthquake waves, tidal waves;
     - Movement of wave form, and of water particles in wave;
     - Function of waves: modify shoreline, aerate seawater;
     - Tides: spring and neap, flood and ebb, rising and falling, slack water, bores;
     - Unequal length of period of rising and falling tide;
     - Relation of tides to navigation.
   - Currents:
     - Causes of currents;
     - Eddy-like character of currents;

Function of currents: modify climate, distribute temperatures in the sea, distribute sediments, affect commerce;

Icebergs and icepacks.

7. LIFE IN THE SEA:

Horizontal and vertical distribution;

Character of deep-sea forms;

Effect of certain forms upon the shoreline;

Comparison of shorelines of polar and tropical seas;

Coral reefs.

8. CHARACTERISTICS OF SEA-FLOOR:

General relief;

Deposits: source and character;

Continental shelf, open sea, deepest sea;

Economic importance of the continental shelf.

THE LAND

1. AREA, DISTRIBUTION, USES;
2. SURFACE OF THE LAND COMPARED WITH FLOOR OF THE SEA;
3. MINERALS: COMPOSITION, CHARACTERISTICS;

Rock-making minerals: types—quartz, feldspar, mica, hornblende, calcite;

Ores: important types—iron, copper, lead, zinc, tin, silver, gold;

Economic minerals: types—salt, sulphur, gypsum, graphite, apatite, corundum;

4. ROCKS:

Igneous: types—granite, trap;

Sedimentary: types—conglomerates, sandstones, shales;

Organic: types—limestone, bituminous coal;

Metamorphic: types—gneiss, mica schist, slate, marble, anthracite coal;

5. ROCK DISINTEGRATION AND REMOVAL—WEATHERING AND EROSION:

Agencies of disintegration: variation of temperature, freezing of groundwater, growth of plants, solution, "rusting" of minerals, decay of plants;

Agencies of erosion: wash of rains, winds, gravity ("creeping");

Formation of soil: local, transported;

Transportation and distribution of waste by streams.

6. RIVERS:

Disposal of rainfall: evaporation, groundwater, runoff;

Function of groundwater: caverns, springs, geysers, artesian wells;

Work of rivers: drainage of the land, transportation of sediments, corrasion of channel, distribution of load;
Life-history of a river:
Normal cycle: baselevel of erosion:
Youth: V-shaped valley, rapids, falls, lakes;
Maturity: disappearance of falls and rapids, shifting and adjustment of divides, profile of equilibrium;
Old age: meanders, ox-bow lakes, floodplains;
Cycle interrupted and new cycle introduced by:
Depression: drowned valleys, dismembered rivers, filled valleys, bays, estuaries;
Elevation: revived rivers, reversed rivers, entrenched meanders, antecedent rivers, engrafted rivers, river terraces;
Change of climate:
Moist to arid: drying up of rivers, salt lakes;
Warm to glacial: extinction of rivers by the ice sheet;
Origin and function of lakes;
Economic importance of falls and rapids.

7. GLACIERS: COMPARISON WITH RIVERS:
Conditions of formation, distribution, and work;
Types: Alpine, continental;
Glacial deposits and glaciated areas;
Glacial periods.

8. EVOLUTION OF LANDFORMS: THE GEOGRAPHIC CYCLE:
Length of cycle a function of:
Initial elevation of the land;
Vigor of eroding agents;
Resistance of rocks.

9. FORMS OF RELIEF:
Plains: coastal, alluvial, lacustrine, glacial;
Belted coastal plain;
The "Fall-line";
Economic importance of plains;
Plateaus: young, dissected, old, broken;
Production of mesas and buttes;
Economic importance of plateaus;
Mountains: block, folded, domed, massive;
Production of "Monadnocks";
Economic importance of mountains.

Volcanoes: origin, and distribution;
Phenomena and materials of eruption, earthquakes;
Lava flows, laccolites, volcanic necks and dikes.

10. SHORELINES:
Regular, due to:
Migration of former shoreline seaward;
Smoothing action of waves and currents.
Irregular, due to:
Migration of former shoreline landward;
Shoreline features of each class;
Harbors: reef, fiord, estuary, river, atol, crater;
Economic importance of irregular shorelines.

SUGGESTED LABORATORY EXERCISES

THE EARTH AS A PLANET:

Construction of diagram to scale showing the correct shape of the earth's orbit, and representing the earth at the equinoxes and solstices, showing the distribution of light over the earth at these times. (2)

Construction of a similar diagram for a globe whose axis is perpendicular, and for one whose axis is parallel to the plane of its orbit. (1)

Construction of diagram showing position of earth, moon, and sun at the several phases of the moon; explanation of these phases, and explanation of eclipses. (1)

Explanation of Eratosthenes' method of determining size of earth, and determination by this method of circle, given an arc. (1)

Construction of diagram illustrating the relation between solar, lunar, and sidereal days. (1)

With globe and diagram of earth's orbit to determine the length of the day at any time of year. (2)

Determination of latitude, north-south line, and local noon. (2)

Making Mercator's map of world. (2)

Making orthographic-polar projection of northern hemisphere. (2)

Study of contour map, as to drainage, distances, and relative heights. (1)

Making vertical sections from contour map. (1)

Making contour map from data given. (1)

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THE AIR:

Determination of altitude by barometer. (1)
Determination of temperature of dew-point. (1)
Study of isothermal charts of the world for January and July. (1)
Location and migration of heat equator and cold pole. (1)
Comparison of temperatures over land and water in different latitudes and at different seasons. (2)
Study of the isobaric charts of the world for January and July, and the distribution of terrestrial winds for those months. (2)
Study of the records of the thermograph, barograph, and hygrograph for a week. (2)
Study of winds of North Atlantic and North Pacific from Pilot Charts. (2)
Construction of weather map from furnished data. (2)
Determination of barometric gradients and wind directions about a cyclone and an anticyclone in map made. (1)
Study of distribution of cloudiness and rainfall about some storm center. (1)
Prediction of weather conditions from data furnished. (1)
Determination of average rate and direction of motion of storm centers in U. S. (1)
Study of conditions of "cold waves" and "northeasters." (1)
Study of some local storm, as recorded by N. Y. Meteorological Observatory, Central Park. (1)
Keeping accurate and detailed non-instrumental daily record of weather conditions for a month, from observations taken about 9 a. m. and 3 p. m. (5)

THE SEA:

Study of ocean current maps. (1)
Study of tide charts. (1)
Construction of tidal curve for some station for the month of December or January, from Tide Tables. (2)
Study of map of world showing heights of land and depths of sea. (1)
Study of trade routes across Atlantic and Pacific, from Pilot Charts. (1)
Construction of diagram explaining production of tides; also explaining high, low, spring, and neap tides. (2)
Study of the various types of shorelines, and their relation to commerce. (2)

Study of positions of lighthouses, life-saving stations, and large cities in relation to the Atlantic shore. (1)

Compare and account for the climates of the east and west sides of northern and southern continents, from study of charts of ocean currents. (1)

THE LAND:

Formation of table of nine minerals showing scale of hardness. (1)

Study of quartz, feldspar, mica, and calcite as types of rock-making minerals. (2)

Study of two ores each of iron, copper, lead, zinc, and tin. (2)

Study of the economic minerals: salt, sulphur, gypsum, graphite, and apatite. (2)

Study of granite, sandstone, limestone, soft coal, slate, marble, and anthracite coal. (2)

Study of the effects of weathering on rocks. (1)

Description of Harvard models. (2)

Construction of river profile. (1)

Making drainage map of U. S. (1)

Study and description of selected type topographic sheets, illustrating various stages of river and topographic development. (2 each sheet)

Study and description of Alluvial Valley of the Mississippi River. (2)

Study and description of selected sheets from 32-sheet map of the Lower Mississippi River. (each sheet 2)

Study and description of drowned river valley. (2)

Planning a journey and describing country to be seen. (1)

Field work, and excursions for the study of topographic forms, glacial phenomena, river work, shoreline features, rocks and minerals, and making topographic map, with detailed description, each (2). (Four excursions in fall and four in spring recommended.)

At the time of examination the candidate must present the note-book in which are recorded, with dates, the results of his laboratory and field work. This book must be indexed, and bear the endorsement of the teacher that the work is the pupil's own. The note-book will count for twenty per cent. of the grade in physiography. It will be returned on request.

EDITORIAL

SUMMER SCHOOLS OF GEOGRAPHY

THE Journal presents this month the annual announcement of the opportunities for teachers to study geography during the coming summer. No attempt has been made to note all the summer institutes at which geography will be taught but merely those, from which information could be secured, at which regular work for a period of six or more weeks will be carried on. Short term courses at summer camps or temporary institutes are valuable for giving inspiration and suggestions that will lead the hearers to do better work.

The more serious work however is to be found at institutions where the regular staff and the regular equipment are available as they are during the academic year.

From the standpoint of the teacher summer school work is most valuable for it gives an opportunity to devote one's attention unreservedly to one topic for a period of several weeks, thus securing more training and more satisfactory results than can possibly be secured from work carried on during the year parallel with class room work, for class room work always has first rights to one's energy and time.

The opportunity also to live amid the equipment and books of a large normal school or university is of great value to a student, especially to one who has been for several years hungering to get at sources of reference not available in a local library.

Intending students would do well also to attend a school at a distance from home if possible. The change of scene and of climate will be a rest and help, and the chance to see geography through travel is not to be looked down upon as valueless. Summer schools of geography are growing in numbers and in strength annually. It is to be hoped that the great variety of courses to be given during the coming summer will be even more successful than before. School geography must grow from the base upwards, and there can be no consistent growth unless the teachers occasionally take pains to grow ahead of their tasks and their pupils.

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REVIEW

A MONOGRAPH ON THE ORIGIN OF THE SETTLEMENTS OF NEW BRUNSWICK[1]

THE borderlands between different subjects are always inviting fields of research in that the worker has the opportunity of bringing together facts and laws heretofore kept rather widely apart by the too sharp definition of individual subjects. Within the last few years we have had a number of excellent books which survey different aspects of the historical-geographical borderland. To that number is welcomed a recent publication of the Royal Society of Canada entitled: "A Monograph of the Origins of the Settlements in New Brunswick," by Dr. William F. Ganong.

This work of 185 pages is a most valued addition to both geographical and historical literature. The statistical data are well-arranged and to the point and are treated in a singularly clear style. In the introduction the author speaks of the irregularity of the geographical distribution of the various settlements and the diversity in nationality of the original inhabitants. Yet for all the complex interrelations which follow from these two conditions it is seen that "every settlement, great or small, has its position, size, and nationality determined by perfectly definite causes, in part historical, in part sociological, and in part environmental." The classification of the work is systematic throughout, the first divisions being made on the basis of time sequence, the second on the basis of the historical, sociological and environmental factors. The monograph is illustrated by nearly a dozen maps showing various distributions. The first is a general map showing the historic origins of settlements, then follow a soil map, a topographic map, a map showing the distribution of the population as to density, a railroad map, and then a series of smaller maps showing the distribution of the population at various stages of growth from the camp sites of the Indians to the cities of the present time.

The lack of an index to the work is partly made up for by an alphabetically arranged synopsis of the origins of individual settlements, an addition which shows the most painstaking industry. The whole work excels in the care exhibited in the collection and arrangement of data and is of value both to the general student and to the investigator in a similar field of work.

I. B.

[1] A Monograph on the Origin of Settlements of New Brunswick. By W. F. Ganong. Pp. 288. J. Hope & Sons, Ottawa, Can.

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RECENT PUBLICATIONS

THE STATESMAN'S YEAR BOOK, 1905. By J. Scott Keltie and I. P. A. Renwick, pp. 1424. The Macmillan Company, New York, 1905.

The latest volume of the Statesman's Year Book is, like its prdecessors, indispensable for reference for all workers in geography. Besides the usual up-to-date descriptions and statistics of all the countries of the world, this volume contains a series of maps, the most useful of which are maps showing the cotton and wheat producing areas of the world and recent boundary changes in South America.

GEOGRAPHEN-KALENDER, 1905-1906. By Hermann Haack, pp. 468. Justus Perthes, Gotha, 1905.

The third volume of the Geographen-Kalender includes a brief summary of geographical events in 1904, a bibliography of the chief publications of same year, obituary notices of the geographers who have died in 1904, and an address list of the geographers of the world. Sixteen maps illustrate the text, indicating the geographical changes of the year.

The Geographen-Kalender is a necessary volume to have at hand for reference and should be in every normal school library.

THE FIRST BOOK OF FARMING. By Charles L. Goodrich pp. 259. Doubleday, Page & Co., New York, 1905.

Goodrich's First Book of Farming is a simple, readable, well illustrated book devoted to the elementary principles of agriculture. The chapter on soils, the uses of soil and the conservation of soil moisture are especially valuable to the teacher of nature study or elementary geography

UNDERGROUND WATERS OF THE EASTERN UNITED STATES. By Myron L. Fuller, pp. 285. Water Supply and Irrigation Paper No. 114, U. S. Geological Survey, Washington, D. C., 1905.

Gives a brief account of the surface features, water supply and springs in different states. Contains a good introductory chapter on sources of ground water with map of rainfall of Eastern United States.

L'EVOLUTION DE LA TERRE ET DE L'HOMME. By G. Lespagnol, pp. 720. Ch. Delagrave, Paris, 1905

This volume is a good summary of general geography, including historical, mathematical, physical, biological, political and commercial geography. Would make a good text-book for a one year course in geography for normal schools.

CURRENT EVENTS

DISASTER IN INDIA

WHAT is probably the greatest calamity by natural forces since the destruction of St. Pierre occurred on April 4th, when a large part of Northwestern India was devastated by an earthquake. The center of the convulsion was in the foothills of the Western Himalayas, near Dharmasaia, on the border of Kashmir. That place was utterly destroyed, and 470 Ghurka soldiers were buried alive in their stone barracks. The Kangar Valley, as large as Massachusetts, was ravaged, Simla, the summer capital of India, was badly shaken, and Lady Curzon narrowly escaped death from a falling chimney. Considerable damage was done to the buildings even as far south as Lahore, and the shocks were distinctly registered in Germany.—*Collier's.*

SAFETY OF THE GREAT ASSOUAN DAM

The great success that has attended the operation of the Assouan dam, in extending the area of cultivable land in Egypt, recently led to the consideration of the question of raising the height of the dam by about eighteen feet —an addition which would greatly increase the capacity of the reservoir. At the request of the government, Sir Benjamin Baker, who is responsible for the design of the Assouan structure, was requested to make an investigation, in the course of which the fact developed that the rush of water, passing under great head and high velocity through the sluice gates, had worn out a series of cavities in the bed of the river below the dam. The structure is built in places upon a rock of a somewhat friable character, and in order to secure a perfectly broad and solid foundation platform, a broad table or bench of concrete was laid in the river bottom, upon which the masonry of the dam was built up. At the time of its construction, it was realized that the scour due to the rush of water through the sluice gates must be provided against, and the concrete platform was extended for a certain distance, forward of the downstream face of the dam. Acting upon Sir Benjamin Baker's recommendation, the concrete platform will now be carried a further distance downstream, so as to make sure that the effects of scour can never work back toward the dam and endanger its stability.

Simultaneously with the investigation of the dam, there appeared in England an academic discussion by two college professors of the question of the stability of dams in general. They advanced a rather fanciful theory as to the probable line of failure of dams, which was quite at variance with ac-

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cepted and well-proved engineering theory on this subject. The proposal to increase the height of the dam; the chief engineer's investigation of the structure; and the curious theories of dam failure, above referred to, offered an attractive coincidence for the reportorial sensation monger, who seems to be getting wonderfully well acclimatized in the field of London journalism; and the British public has been treated to whole columns of matter tending to prove that this costly engineering improvement is doomed to short life, if indeed it is not liable to be swept down the Nile Valley without a moment's warning.

As a matter of fact, the Assouan dam, so far from being in any danger of failure, has a margin of stability so great as to render it possible to add the 18 feet of height suggested, and still leave the structure proof against overturning, or rupture, for all time to come.—*Scientific American.*

THE VESUVIUS OF AMERICA

Every traveler through Old Mexico hears of one spot which is more attractive to tourists from abroad than any other. This is the volcano of Popocatepetl. Some have called it the "Vesuvius of America," owing to the frequent eruptions which have marked its history; but unlike Vesuvius, its crater has been entered by man, and, remarkable as it may seem, here has been for centuries the site of a great natural industry. Popocatepetl has been producing sulphur probably for ages, according to the opinion of geologists and other experts who have examined the interior of the crater as far as it has been possible to venture with safety. True, it is by no means an extinct volcano. By day clouds of steam and smoke arise from the summit of the mountain, and at times in the night the sky above is illuminated by the glow from the fiery mass whose existence is revealed through the occasional vent here and there in the temporary bottom of the crater. It is a strange sight to witness human beings toiling in this abyss day after day, extracting the sulphur ore, as it is called, with pick and shovel, and "packing" it on their backs to the edge of the crater where it is hoisted to the top. Some of the peons have labored in these depths 550 feet beneath the earth's surface for the greater part of their lives, since sulphur mining, as it is called, has been carried on in the bowels of Popocatepetl for four centuries; yet no one knows when an eruption may occur which would destroy every living thing for miles around.

From where they toil, the workmen can clearly discern the fissures whence the escaping sulphur fumes and smoke prove that beneath them there is a furnace of nature; but were it not for the crevices the accumulation of the sulphur deposit would cease, for they form a portion of the great natural

laboratory in which this material is compounded. The history of Mexico proves the age of this industry, for Cortez obtained sulphur, probably from the summit of the volcano, to use in manufacturing gunpowder for his soldiers. Since that time, the substance has been obtained by the natives when the volcano was not in such a state of activity as to keep them from approaching it. For several years recently a considerable quantity has been secured, although by a very crude method. As already stated, the beds are worked by hand labor, the sulphur being placed in bags containing 25 pounds each. They are placed on the backs of human packers who carry them to the foot of the crater and attach them to a rope suspended from the top. Then each is hoisted singly by means of a windlass. At the top the bags are given to other peons who seat themselves on straw mats and slide over the snow which covers the outer portion of the mountain to the timber line. At this point the sulphur is placed on mules to be transported to the railway station about nine miles distant.—*Scientific American.*

THE WIDENING OF VIENNA

On December 28 last the city limits of Vienna were extended on the east by taking into the municipality an area on the left side of the Danube about half as large as the city and including a number of towns. With the exception of a very small territory the city has hitherto been confined to the right bank of the river. The added territory will form the twenty-first district of Vienna, with the name Floridsdorf. It includes 9,314 hectares. which will increase the area of the city to 27,126 hectares. This makes Vienna now the largest city of continental Europe, and it is surpassed only by Greater London, with its area of 30,218 hectares. The result of the union is not so important in its addition to the population of the city, as it adds only 61,536 persons. The city in its new extent had, on December 31, a total population of 1,878,339, being still surpassed by London, Paris and Berlin in number of inhabitants. The *Deutsche Rundschau für Geog. u. Stat.* (Vol. 27, No. 6), from which these facts are taken, has a map of the city in its new extent on a scale of 1:75,000, or 1.18 statute miles to an inch. —*Bull. Am. Geog. Soc., April, 1905.*

NOTES

Drift of a Bottle in the Atlantic.—A bottle thrown overboard in latitude 29° 30′ N., longitude 68° 10′ W., by Colonel Swalm, United States Consul at Southampton, England, in May, 1903, has just been found on the Donegal coast, Ireland, near Arranmore. The bottle had apparently

been carried by the Gulf Stream and drift along the North American coast, then across the Atlantic to the Irish coast. To travel this distance it had taken 662 days, at an approximate speed of five miles a day.—*Bull. Am. Geog. Soc., April, 1905.*

AUTUMN RAINFALL AND THE YIELD OF WHEAT IN ENGLAND.—In the London *Times*, February 7, 1905, Dr. W. N. Shaw, F. R. S., called attention to a relation between the autumn rainfall and the subsequent yield of wheat which is remarkable. "Autumn" is a season of thirteen weeks, covering approximately the months of September, October and November, and the figures for the yield of wheat express in bushels per acre the average yield for England as given in the returns of the Board of Agriculture. With certain exceptions it is seen that "every inch of autumn rainfall involves a diminution of the yield of wheat for the following year by a bushel and a quarter per acre." Seven years out of the twenty-one considered give an agreement within a half bushel, when the yield is computed from the autumn rainfall by subtracting from the datum of 39.5 bushels per acre one and a quarter bushels for every inch of autumn rainfall. Among the reasons given for the influence of the autumn rainfall upon the wheat yield are the washing of nitrates from the soil, and the postponement of sowing to the spring because of the moisture; but still, the close relation remains a very remarkable fact. The study is based on averages over large areas, and the conclusions might have to be modified if separate districts were considered. Dr. Shaw read a paper on this subject before the Royal Society on February 2, 1905 (*Nature,* March 16), and the *Times'* letter is reprinted in *Symons' Meteorological Magazine* for February.—*Bull. Amer. Geog. Soc. April, 1905.*

ENGLISH FOGS AND COMMERCE.—All are more or less familiar with the geographic fact that England, and the English cities, have dense fogs. But few realize their commercial significance. United States Consul Mahin, stationed at Nottingham, gives us a number of interesting items, some new and some familiar to students, concerning such phenomena. The fog becomes most dense after sundown, often gradually melting away toward midday, but occasionally continuing all day. A very thick fog rarely lasts more than two or three days. The first ones come with the autumn frosts, corresponding in time and atmospheric conditions with our Indian summer. The air is very still and the temperature relatively low. Densest fogs are usually in November, but the maximum number of foggy days is in December, then November, January, and October. The average annual number of such days in London is 55—45 from October to March. Clearest months are May-July. Least stormy years are freest; cold and quiet years have most.

It is stated by many authorities that the fog is much aided in formation, as well as intensified, by the presence of dust particles, as those of smoke. Coincident with this comes the statement that the fogs are thinnest and rarest in the months when coal is burned least. It has been pointed out that they increased as the use of coal grew, and that during the last fifteen or twenty years they have become less dense, owing to the more extensive use of electricity and to systematic attempts to abate the smoke nuisance. Hence it appears that they are related to the great industrial development of the cities, and belong more especially to the purely coal-using stage in that evolution.

They seriously interrupt business of all kinds—delay passengers, increase risk, increase help needed, and expense of precautionary measures. Extra labor is employed, and even the pay of engineers and firemen is increased during fog days. Detention of goods and delay in delivery cause loss which often falls on the railroad companies. The moisture damages store goods and furniture, furs and textiles. The death-rate increases and throat and lung troubles are aggravated. The author mentions some discussions and suggestions of means to disperse or partially dissipate fog.—*Consular Report, February, 1905.*

Cotton-Growing Possibilities in the Tropical Section of Australia.—At a meeting of the Victorian Branch of the Royal Geographical Society of Australasia in Melbourne (*Victorian Geog. Jour.,* Vol. XXII, 1904) a paper was read by Dr. Thomatis, an Italian resident of Queensland, who has successfully experimented in the hybridization of different species of cotton. He has evolved a marketable type, which he has named *caravonica.* It is asserted that this cotton thrives in a moist, tropical country like Queensland, and promises to be very productive. The *Financier* of London says there is a fair prospect that the cultivation of this cotton will be undertaken on a large scale, not only in Queensland but through the whole tropical territory in the Commonwealth north of 18° S. latitude. The sole difficulty in the way is the restriction imposed on the immigration of colored labor. It is said that, at the low rate of one-third of a bale to the acre, a total of 20,000,000 bales of the fibre may be produced in a year (!).—*Bull. Am. Geog. Soc., April, 1905.*

Commerce of the United States.—The commerce of the United States has increased from 1½ billions in 1880 to 2½ billions of dollars in 1904, while the commerce of the world meantime has increased from 15 billions to 22 billions, the relative increase made by the United States being thus greater than that of the other parts of the world.

The principal mineral products entering into and forming the basis of

industry and commerce are coal, pig iron, copper, lead, zinc, petroleum, and the precious metals, and in the production of each of these the United States has shown a wonderful development during the twenty-five years under review. The relative growth in the production of the various basic articles of industry in the United States and the world, respectively, has been in the period from 1880 to 1903: Coal, United States, 251 million tons, entire world, 536 millions; pig iron, United States, 14 million tons, entire world, 28 millions; copper, United States, 284,627 tons, entire world, 459,185 tons; lead (period 1880 to 1900), United States, 154,468 tons, entire world, 654,043 tons, zinc, United States, 121,410 tons, entire world, 331,589 tons; petroleum (1890 to 1903, the longest period for which a comparison is possible), United States, 54 million gallons, entire world, 47 million gallons.

The United States produces 37 per cent. of the world's coal, 39 per cent. of its pig iron, 51 per cent. of its copper, 25 per cent. of its zinc, and 51 per cent. of its petroleum. In the production of coal, pig iron, copper, and petroleum the United States leads the world.—*Cons. Repts.*

How We Use a Railroad.—A railroad is not, usually, a desirable adjunct of a school-yard, but we find it of use in several ways.

First, to build the road, a deep cut had to be made through a gravel hill. This cut in itself serves as a cañon or a steep sided valley according to the progress of the work, and the walls, or banks, offer a near field for observing many facts of erosion and deposition. Many simple and involved river systems with falls, rapids and consequent valley features develop during each rainstorm.

Heavy falls of rain furnish torrents which eat into the bank fast and carry large stones long distances. Light storms furnish less water and show less damage to the ground. Then, too, as the streams reach the bottom of the bank and run along the track they illustrate loss of transporting power, and the upbuilding of mud flats, or flood plains, of the finer sand on the floor of the cut. Some streams are found only while water is flowing. Other beds remain deeply marked at all times. Cañons, wearing of divides, broadening of valleys, frost action, the creeping of snow masses down the slopes, miniature glaciers, wind-wearing and mechanical erosion are all to be had for a look out of the windows.

The railroad itself is heavily a freight line. The schoolhouse is situated at the highest point on an "upgrade" of three miles. Long and heavy trains get "stuck" almost daily beneath our windows and have to await the assistance of the next on-coming engine. From this we see some effects of land slopes upon railroading.

The children delight to watch and report the various names of shippers

and railroads they find labelled on the freight-cars; also, the different specimens of live stock and manufactured products seen in them.

Then the discussion of "What are the things for?" "Why are they sent back and forth?" "From where do they come?" lead us to see that our "home observation" demands some information of distant parts of the United States and Canada, and the children gradually get a bit of an insight regarding producing areas, and consuming centers, and the industries of agriculture, manufacturing and commerce.

The following lists of freight cars, and visible contents were reported at one class period. They were reported miscellaneously and sorted by the class into food supplies, clothing and building materials. The need for ex-

The Location of the School House

change came to light and finding the home of the cars and the time used in getting from point to point enlarged their conception of country.

Cars: Canadian Pacific, Pennsylvania, New York, New Haven & Hartford, Lehigh Valley, New York Central & Hudson River, Ohio Valley, Grand Trunk, Lackawanna, Cincinnati Central, "C., B. & Q.," Wabash, Michigan Central, Erie, "New Orleans," South Virginia, "Seattle Lumber," "Armour," New Jersey Central, Pittsburg & Lake Erie, "Anchor Line," Rutland, "Empire Line," Boston & Maine, Maine Central, Minneapolis & St. Louis, Baltimore & Ohio, "Fruit Growers' Express," Texas & Pacific, Great Northern, "Union Line," Chesapeake & Ohio, Père Marquette.

Contents: Milk, stone, cattle, machinery, wood, lumber, boxes, wagons, horses, hay, coal, grain, spring water, pigs, butter, beer, glass,

vegetables, oats, ice, wool, sheep, sods, oil, manure, gravel, iron rails, poultry, wheels, logs, coke, shingles and sand.

FOODS	CLOTHES	BUILDING, ETC.
Cattle—milk—butter	Cattle	Stone—wood
Sheep—pigs—poultry	Wool	Lumber—glass
Hay—grain—oats	Sheep	Gravel—iron rails
Vegetables	Poultry (feathers)	Wheels—logs
Spring water		Shingles—sand
Ice		(Sods—oil—coke
Beer		Coal—machinery
(Manure) for gardens		Boxes—wagons—horses)

E. L. PRATT.

A CONVENIENT MATERIAL FOR RELIEF WORK.—In the school-room we are more and more becoming champions of the pedagogical adage that, "The way to learn to do a thing is to do it." We are more and more becoming dissatisfied with talking to the pupil *about* things. On the other hand, we wish the pupil to *see* things for himself; to handle them when that can be done; to make things when it is within the scope of his work to do so. It may be that he will not care a whit for the thing when he has made it, though the teaching now tends toward having things made that may be made of some more or less good use; but the very fact that the pupil makes something imbues him with the feeling that he *can do* things, and that confidence in self-ability is in his after life, "A consummation devoutly to be wished."

The boy who grows up through childhood and youth and into young manhood under the condition of having everything done for him—of having his parents, his friends, his teachers hand over to him ready made, all bargained for, shaped and ready for his personal use everything of that vast assembly of articles and conditions which go to make up his wants—that boy is being hampered for his future activity by not being brought into the action of the developing factors of his boyhood environment.

A boy thus unwisely cared for has had, when he arrives at young manhood, an influence of negation shaping his mental attitude into the way denying him initiative, and he comes to the need for push and energetic activity with a feeling of "Can't"—the greatest curse that blights the field of accomplishment of the clean young man's later life. He never *has* assumed the initiative during the years of his adolescence, when his mind was being shaped into those attitudes which later largely determine his powers of doing things; and when the strenuous life begins in earnest, he not only does not know that he *can* do things, but he thinks that he *cannot,* and upon that attitude hangs much future woe.

If more parents would systematically cultivate self-confidence in their boys and girls by allowing them greater exercise of initiative in such common things of their every day wants as the bargaining for clothing even, and in the many other outlets of personal choice and individual activity; if more teachers would insist upon drilling the pupils' minds into a cheerful and confident attitude toward *belief* in their ability to do things, *with* things themselves, and against being satisfied with merely hearing about things which then seem to be far removed from their actual surroundings into some far off region of semi-reality; if the boy were, at home and in the school, more generally given a fair show for his future welfare by being schooled to grow up familiar with the thought of "I Can," there would be less despondency in the years to come, and the lines of tragedy would fewer of them be written across the face to tell their sad story of struggle with self and failure.

I believe that we are moving in this direction of adopting the doing of things for the sake of impressing the pupil with the character-shaping thoughts of self-power; and to come to my subject, one little item in that schooling is the pupil's exercise in the making of the thousand and one things that are made in wood or clay or paper pulp or what not. One of these things is the relief map. This is made from the relief maps in the geography texts, from the plain maps there found, and from the topography of the pupil's immediate neighborhood, beginning with the simple and easily made portions and grading up into the more and more complex areas.

I am not speaking of this sort of work as something new. It has been done for years; but we don't have enough of it—the general modeling work, I mean, of which this may stand as representative. Good clay is expensive and difficult of attainment for the small school and especially for most of the rural schools. Paper pulp is mussy and is likely to sour and smell badly. The purpose of this article is to suggest the use of something within reach of every teacher; namely, starch and common salt.

By mixing these substances, about half and half, into a paste, a material is obtained for relief modeling that will not become stale, is clean, can be prepared quickly and in small quantity; and when dry, the salt crystals give the work a glistening white appearance that is very pleasing to old and young alike.

In my own work, I procured, at the dry goods stores, some dry goods boards, which I used as the background for the relief work. These boards I sawed in two transversely, thus making two modeling boards out of each. These I painted black and into the middle of the end of each I fastened longitudinally a screw eye for hanging the work up along the wall. The

white, glistening work upon the black background makes a very pretty effect. These reliefs may be preserved by coating them with shellac, spread on with a soft brush.

On one occasion, I selected a half dozen of the better ones of the relief of South America, done in the eighth grade, photographed them, and presented the pictures to the pupils. C. C. GRAY, Head of Department of Science, High School, Fargo, N. D.

NECESSARY GEOGRAPHICAL FACTS.—The consequent necessity for selecting the most essential minimum from an excess of useful facts legitimately within the scope of elementary geography, would make any general agreements impossible, were it not for the fact that there is enough material admittedly and conspicuously important to consume in its mastery such time as can be assigned to mechanical drill as distinct from illustration and discussion. It is probably for this reason that certain of the following propositions were almost unanimously approved by the fifty representative school men to whom they were submitted. The facts thus included in the core of the curriculum, however they may be distributed among the grades, should be continually drilled upon from the time they are first introduced until the close of the school course. Other facts may be permanently remembered. These must be.

1. While the general form of the earth as a whole, that is, the outline of continents and oceans in relation to each other—should be presented to pupils before they have mastered the leading facts in the industrial and political geography of the United States, the detailed physiography of the earth as a whole should not be so presented.

2. Physiographic facts should be limited to those necessary to a fair comprehension of industrial and political facts, and should be taught in connection with the facts they serve to explain, rather than as introductory to industrial and political geography.

3. Pupils should be required to be so familiar with the outline of the various states of the Union that they can recognize them by their form at a glance.

4. With regard to the general outline of leading countries outside of the United States, the ability to name those adjacent to each other is all that should be required. With minor countries only the general location should be clearly determined, as in western Asia, in Central America, etc.

5. In comparing areas of states or countries no more exact knowledge should be required than that which results from the visual comparison possible when drawn upon the same scale. Some one state in the Union, as Pennsylvania, may be used as the basis of comparison between states or

smaller countries, and the United States may serve in a general way for comparison with larger countries.

6. The capital of each American state and of important countries outside of the United States should be required, but not its exact location unless otherwise important. The capitals of minor countries should not be required.

7. A specified and limited number of cities, other than capitals, should be taught, but only such as have pre-eminent characteristics, which should be associated with their names and locations. Exact location is not necessary except in cases of ports upon proper bodies of water. Other cities, where possible, should be located in particular industrial sections, such as the coal regions, the wheat belt, etc.

8. Only those products of a country should be required which are most characteristic, or are responsible for American imports or exports. With such products should be associated the natural and social conditions which make them possible, so far as they are within the ready comprehension of the pupils.

9. The forms of government should be taught as compared with distinctive models, thus making prominent essential or characteristic features only.—*Penn. School Journal.*

BUDAPEST

The beautiful capital of Hungary is—barring St. Petersburg—the most disturbed urban center in Europe to-day. For many moons the keen eyes of journalists and diplomatists have been focused upon its Magyar Parliament, to see what new form of impassioned outbreak the legislators may indulge in. In their displeasure recently at Premier Tisza, a faction broke up the desks and chairs, wrecked the choice furniture of the platform, tore in pieces the bills under consideration, and hung the effigy of the Prime Minister—all a rather rich spectacle of fury by what is called by courtesy a deliberative body.

The Hungarians are nothing if not intense. And the race jealousies of the Magyars, Germans, Austrians, Croatians, that make up the conglomerate population, find their most eruptive expression in the legislative chamber of the capital. Everybody from noble to scullion discusses freely and passionately the present unwelcome union with Austria, and prophesies of what may occur when the present representative of Hapsburg rule shall have paid the debt to nature.

Budapest is among the finest and most attractive of European capitals. It is really a twin city, as New York and Brooklyn. Buda is on the right

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bank of the Danube, and Pesth on the left. They became one city in 1872; and the sign of their union is the glorious suspension bridge 1,272 feet long, and that cost $2,300,000. Two other great bridges arch the swift flowing river, and scores of ferries ply between the opposite banks.

The topography of the two segments of the city is singularly different. Buda is built on a series of bluffs and high hills, that furnish the choicest sites for chateaus, imperial palaces, and fortresses. Pesth is built on a low, level, sandy plain, that is in constant danger of inundation when the snows of the Tyrolese mountains are suddenly melted, and thrown into the channel of the mighty stream. Incalculable damage was done the city by a flood in 1838, when thousands of dwellings were swept away, and a myriad people lost their lives.

The population of the two segments differs very materially, both in numbers and character. In 1900, the city was credited with 510,000 inhabitants, of which Buda had about one-fifth, and Pesth four-fifths. Buda is quiet, conservative, and inclined to be aristocratic. Court retainers and army officers are largely responsible for its tone. Pesth is a bustling, progressive, and more democratic city. It is not without its palaces of the Hungarian nobles, but its chief feature is the multitude of middle-class homes. It has spacious streets, some 100 to 150 feet wide, and paved either with wooden blocks or asphalt.

One of the most pleasing sights is the great boulevard along either bank of the river. Two rows of beautiful acacia trees run the entire length of each boulevard, and a spring or summer evening stroll along these avenues, when the myriad lights are gleaming amid the tender foliage, and the stars are reflected in the mirror of the river, is pronounced by tourists as nearly akin to paradise as anything earth can afford.

While Buda has the royal palace with its hanging gardens, dating from the days of Maria Theresa; its grim, grey fortress; its fine churches and synagogue; and its great dockyards of the Danube Steam Navigation Company; yet Pesth wears the palm for its magnificent structures. Back of its boulevard, and paralleling the river for two and a half miles, are handsome and massive stone buildings that it would be difficult for any other European city to match. Some of these are great warehouses, wholesale business houses, a peculiarly imposing custom house, and, finer than all, the Hungarian houses of Parliament. St. Leopold's church, and the Jewish synagogue in Pesth are the finest ecclesiastical buildings in Hungary.—*The Journal of Education.*